

DIGITAL DESIGN STUDIO  
GLASGOW SCHOOL OF ART

ENGAGING WITH THE VISUAL: RE-THINKING  
INTERPRETIVE ARCHAEOLOGICAL VISUALISATION

Joint portfolio with dissertation submitted for the degree of  
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Alice Elizabeth Watterson, M.A., MSc.

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I, Alice Watterson declare that the enclosed submission for the degree of *Doctor of Philosophy* and consisting of *Joint Portfolio with Dissertation* meets the regulations stated in the handbook for the mode of submission selected and approved by the Research Degrees Sub-Committee.

I declare that this submission is my own work, and has not been submitted for any other academic award.

Signed



Student: Alice Elizabeth Watterson



Director of Studies: Dr Paul Chapman

This thesis is dedicated to Irene Wood

## Abstract

Archaeology is a visually rich discipline with multiple avenues for visualisation within the field. In recent years the rising dominance of digital techniques for archaeological three dimensional surveys and interpretive visualisation has resulted in a rapid uptake of technologies without adequate assessment of their impact on the interpretive process and practitioner engagement. As such, fundamental issues with their application remain problematic and largely unresolved. This research moves the current debate forward by assessing the practices and practical application of visualisation within archaeology in order to understand and develop its role when framed within academic research practice.

Through the observation, exploration and collaboration of various techniques and approaches to visualising the archaeological record this research challenges common preconceptions and assumptions associated with 'reconstruction', redefining its role within the field by investigating the following research questions:

- In what way is a practitioner's interpretive engagement with an archaeological site mediated by different data capture and visualisation methods in the field?
- How might practitioners of archaeological visualisation combine the creative and subjective methods of storytelling and visual expression with the more systematic and traditional means of data collection and visualisation to create dynamic and challenging imagery which promote cognition?
- How can we foreground and communicate the importance of the interpretive process involved in the creation of engaging visualisations to general audiences?

Using a series of case-studies from sites managed by Historic Scotland on both St Kilda and Orkney the research will consider each stage of the visualisation process in detail, from collection of digital spatial and visual data in the field, to the creation of engaging three dimensional models and animations, to consumption of the output by varying audiences across a range of settings. The overall aim is to develop a clearer understanding of the ways in which interpretive archaeological visualisation and the creation of subjective narratives influences engagement with the site, the integrity of the captured record, the control of experience and the ways of dealing with uncertainty in the archaeological record in order to establish where and how it may sit within a broader academic framework.



## Relevant Publications

Watterson, A. 2012. 'The Value and Application of Creative Media to the Process of Reconstruction and Interpretation.' in A. Chrysanthi, P. Murrieta Flores and C. Papadopoulos (eds.) *Thinking Beyond the Tool: Archaeological Computing and the Interpretive Process*. BAR International Series 2344, p. 14-23.

Watterson, A., Baxter, K. and Watson, A. 2014 'Digital Dwelling at Skara Brae' in I. A. Russell and A. Cochrane (eds.) *Art and Archaeology: Collaborations, Conversations, Criticisms*. New York: Springer, p. 179-195.

Geddes, G. and Watterson, A. 2014 (*forthcoming*). 'A Prodigious Number of Little Cells: Cleitean and the St Kilda World Heritage Site' *Journal of Architectural Heritage*. Architectural Heritage Society of Scotland.

## Relevant Exhibitions

"*Digital Dwelling at Skara Brae*" film and exhibition ran from May to August 2013 onsite at Skara Brae.

The film was also shown as part of Jim Pattison's "*Models of Mind*" Exhibition at the Pier Arts Centre in Stromness.

Additionally the film was shown as part of a "Neolithic Art" children's workshop lead by the author at the British Museum on the 22<sup>nd</sup> and 23<sup>rd</sup> March 2014.

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# **1 Introduction**

This research is focussed on the interpretive graphic representation of past societies; specifically the archaeological visualisation of people, material culture, sites and landscapes. Archaeology is a visually rich discipline which frequently utilises images as a means of communicating complex ideas and information across a range of media with numerous avenues for visualisation within the field such as illustration, reconstruction, photography, digital survey and artistic impressions. However, despite the apparent prominence of digital visual techniques in archaeology, fundamental issues with its application remain problematic and largely unresolved. Reconstruction-style images in particular have a problematic history of largely uncritical creation and use within archaeology (for example, Molyneaux 1997, Smiles and Moser 2005, Cochrane and Russell 2007, Pujol-Tost 2008). Much of the literature suggests that the potential of archaeological visualisation has yet to be fully realised, though few elaborate on exactly what that imagined potential may be, and fewer still have attempted to provide any practical demonstration. This research moves the current debate forward by assessing the practices and practical application of visualisation within archaeology in order to understand and develop its role when framed within academic research practice.

Using a series of case-studies from sites managed by Historic Scotland on both St Kilda and Orkney the research will consider each stage of the visualisation process in detail, from collection of digital spatial and visual data in the field, to the creation of engaging three dimensional models and animations, to consumption of the output by varying audiences in a range of settings. The overall aim is to develop a clearer understanding of the ways in which archaeological visualisation and the creation of subjective narratives influences engagement with the site, the integrity of the captured record, the control of experience and the ways we deal with uncertainty in the archaeological record in order to establish where and how it may sit within a broader academic framework.

This chapter will introduce the research background and identify the research problem. The purpose for this study, its significance in terms of the contribution to new knowledge, the research questions, aims and hypothesis will then be discussed and the research design summarised before providing a chapter outline for the thesis as a whole.

## **1.1 Background**

Archaeological visualisation has its origins in early sketches and paintings of archaeological sites and landscapes dating to medieval times, though it did not begin to develop as a recognised archaeological practice until the illustrations of Pitt Rivers in the late 19<sup>th</sup> Century, becoming further established with the iconic reconstructions of Alan Sorrell in the mid to late 20<sup>th</sup> Century. During the 1990s rapid uptake of

digital technologies saw the advent of virtual reality modelling for heritage and from there archaeological visualisation became a field of study in its own right. Today there are a number of conferences either entirely dedicated to or offering a significant number of sessions concerning visualisation in archaeology including the International Symposium on Virtual Reality, Archaeology and Cultural Heritage (VAST) and Computer Applications in Archaeology (CAA). Additionally, there are specialist departments at the Centre for Digital Humanities at University College London, King's Visualisation Lab at King's College in London, the Archaeological Computing Research Group at the University of Southampton and more recently the International Heritage Visualisation MSc course at the Digital Design Studio, Glasgow School of Art.

Archaeological visualisation can constitute a variety of approaches, from pen and ink style illustration to computer-aided spatial analysis or three dimensional modelling and photogrammetry. This multitude of applications and media means it is difficult to make generalisations about this field. However, regardless of the method employed the act of visualisation does not begin and end with a final image; rather it is a process.

## **1.2 The Research Problem**

This research primarily argues that the field of archaeological visualisation frequently falls short of its potential. The media used for the visualisation of archaeological sites and evidence have greatly advanced in the past decade and many technologies originally developed for the architectural and entertainment industry have become widely available within the heritage field for both survey and speculative three-dimensional modelling. Although this technology continues to advance, theoretical understanding of its value and application for archaeological visualisation remains slow in comparison and the majority of methodologies behind their creation remain unchanged and unchallenged. In this sense archaeological visualisation has to some extent been guilty of allowing itself to be led by advances in technology.

At its core, archaeological interpretation is a complex process largely concerned with bridging the gaps between excavated material culture and a sense of life in the past. This process increases in complexity within the different communities of theorists within archaeology, particularly when the excavated evidence is interrogated with the aim of determining a sense of the intangible. However, the ways archaeologists have dealt visually with such subjects as process, agency, embodiment and lived experience have often been uncritical and far from transparent.

In light of this, a major debate in the field at present concerns the ways archaeologists might document the visualisation process when producing interpretive imagery for academic or public consumption. For example, the London Charter has been proposed as the standard for documenting the visualisation



process, with some of its contributors such as Baker (2012) advocating the generation of paradata alongside more traditional metadata when producing archaeological visualisations with the aim of promoting intellectual transparency in the field of digital heritage. Paradata constitutes the documentation of the intellectual processes involved in the creation of archaeological reconstructions and in the context of the London Charter it is geared towards the digital reconstruction types of images. Although the concept of documenting paradata is beneficial as it recognises the significance of process over the final visual outcome, in practice it has not yet been successfully integrated into wider practical methodologies in the field outwith the group of academics who developed the concept.

In addition to the practical and academic side of visualisation in archaeology, the dissemination of these images in a public heritage context is also important. Wider consumption is a crucial tool for evaluating visualisation as archaeology has always held a great deal of public interest. Regardless of any academic origins, the majority of archaeological visualisations will end up in the public eye. This relationship between the public and the archaeological reconstruction or 'artist's impression' has resulted in a potentially misplaced series of expectations about what visualisation can and should represent in archaeology.

### **1.2.1 Research Questions, Aims and Significance**

This research proposes that in the field of archaeological visualisation foregrounding the importance of process and engagement will result in the visual output being of far greater interpretive depth and validity as a research practice in itself. The research will move the current debate forward by re-thinking the way in which interpretive visualisations are produced and consumed within the field of archaeology and heritage. Through the observation, exploration and collaboration of various techniques and approaches to visualising the archaeological record this research challenges common preconceptions and assumptions associated with 'reconstruction', redefining its role within the field by investigating the following research questions:

- In what way is a practitioner's interpretive engagement with an archaeological site mediated by different data capture and visualisation methods in the field?
- How might practitioners of archaeological visualisation combine the creative and subjective methods of storytelling and visual expression with the more systematic and traditional means of data collection and visualisation to create dynamic and challenging imagery which promote cognition?
- How can we foreground and communicate the importance of the interpretive process involved in the creation of engaging visualisations to general audiences?

Within archaeological discourse at present there are a multitude of applications for visual media, particularly digital survey and visualisation techniques for the investigation and communication of the archaeological record for consumption by public and academic audiences alike. Although there is a growing body of literature and an increased appreciation within the field for expressions which illuminate and expose the interpretive and artistic qualities of presentation and narration (for example, Cochrane and Russell 2007, 3, see also Renfrew 2003, Renfrew *et al* 2004, Cochrane and Russell 2014), few in academia actively engage with expressive practice as part of their research methodologies. Cochrane and Russell (2007, 3-4) believe that exploring contemporary relationships with visual expression can facilitate broader understandings of complex interpretations of the archaeological record. They raise concerns that an avoidance of reflexive visual literacy in archaeological practice threatens the meaning and value of visualisation for research practice within the field.

The significance of this research is that it actively engages with the subjective and creative elements of the visualisation process and provides a reflexively practical solution by means of the case studies. The research will investigate the application of visualisation in the field of archaeology firstly by examining the ways in which visual data is collected in the field today, then by conducting a series of subsequent case studies which explore the tensions between subjective and objective approaches to visualising the archaeological record. The work assembles a variety of visual techniques together into one coherent narrative, engaging with creativity and subjectivity as part of academic practice without compromising the integrity of the interpretation.

### **1.2.2 Research Design**

This study is focussed on the production of interpretive visualisations for general-audience consumption in a heritage context. The case study sites range from post-medieval to prehistoric and represent a selection of Scottish sites which have recently been digitally surveyed by Historic Scotland. These sites are:

- The various phases of upstanding settlement on the island of Hirte in the St Kilda archipelago.
- The Neolithic village of Skara Brae which forms a significant part of the Heart of Neolithic Orkney World Heritage site.

In order to examine the processes involved in the visualisation of an archaeological site in detail, the visual work generated for this thesis has been defined into different chronological stages along a simple workflow.

Collection → Creation → Consumption

These stages are briefly outlined here but will be discussed in detail in Chapter 4. 'Collection' largely defines the fieldwork stage of a project whereby data is compiled. In the case of this research this is usually by means of survey, excavation or site visits. The interpretive process usually begins at this stage, though as the semi-observational pilot case study will demonstrate the automated task of laser survey can restrict interpretive engagement in the field. The following stage, 'creation', concerns two significant phases. First, the processing of data into coherent spatial information, representative of the site or artefact as it is today and secondly, the reconstruction of the landscape, structures and artefacts as they may have appeared in the past in terms of their context, aesthetic appearance and activities performed. The 'consumption' stage deals with the presentation and display of the end product of each project, considering and analysing audience feedback by means of a questionnaire and in some cases verbally. In accordance with best practice as outlined by initiatives such as the London Charter, each stage will be subject to frequent self-reflexive analysis and documentation in accordance with the principles of paradata throughout.

Although within the scope of this research instrumentation for the collection of data ranges in the specific medium used, all visual material produced as part of this thesis was either born digital or has been digitised for incorporation into the final outcome. The use of digital media for archaeological visualisation is logical in the field at present as data collection has become almost entirely digitized in recent years. As such it makes sense to continue to process and visualise the source material in a complementary medium.

The theoretical framework within which this research operates adheres largely to a post-processual way of thinking and interpreting the archaeological record which itself concerns social themes of agency, materiality, symmetry, phenomenology and representation (Hodder 2012, 7). Where the majority of archaeological interpretive visualisation work tends to shy away from introducing elements of subjective interpretation, the methodology for this research instead actively engages with the more subjective elements of the visualisation process in order to gain a greater understanding of the consequences of their use. Post-processual themes in experience, engagement and creative practice will be explored and developed through the case studies.

### **1.3 Thesis Chapter Outline**

Chapter 2 aims to introduce visualisation in greater depth, providing an introduction to this field on a broad scale before delivering a comprehensive account of its shifting roles and various manifestations within archaeology. Having demonstrated the variety of modes of visualisation within archaeology and

the ways in which each operate within their own constraints, conventions and context, the chapter will then define 'visualisation' as it has been interpreted and utilised within the framework of this thesis.

Chapter 3 presents a summary of the history of visualisation in archaeology leading up to its current application in the discipline today. The discussion will then progress to consider the present state of visualisation in the field in terms of theoretical framework, best-practice methodologies and problematic preconceptions and limitations of the role visualisation presently plays in the field of academic archaeology and public heritage presentation. Chapter 4 presents the methodology and a more detailed account of the research design where methods and techniques will be discussed and justified.

Chapter 5 documents the case studies conducted as part of this research which constitute three major sections split between two sites. The first section details the pilot study which serves the dual purpose of closely observing the data collection phase of the visualisation process by participating in a laser and photogrammetry survey and working through a self-reflexive standard visualisation project which culminated in the reconstruction of a 19<sup>th</sup> century blackhouse on the village street on Hirte, St Kilda. The second and third sections document different stages in the Skara Brae study, which itself represents a collaborative solution to the issues and weaknesses identified through the pilot study on St Kilda. The first part deals with data collection during fieldwork and the creation of a collaborative short film. The second covers the academic and public consumption of the project output.

The remaining Chapter 6 forms the discussion and conclusion whereby the implications of the findings following the case studies will be considered and evaluated in light of the research questions outlined in Chapter 1. Results will be appraised in the context of the current literature and suggestions will be made to the effect of proposing a new theoretical discourse when producing and consuming interpretive visualisation within archaeology and heritage. This chapter builds upon what was learned from the Skara Brae case study in terms of successes and limitations of the method and applies these lessons to the visualisation of the prehistoric remains at the Links of Noltland on Westray, Orkney.

## 2 What is Visualisation?

A fundamental issue with the application of visualisation is the way in which these interpretative images are created, displayed and consumed within expert and general audiences alike. In order to assess and reevaluate this complex field of study it is necessary to establish some definitions for the use of the term 'visualisation' in archaeology and specifically within this thesis. Defining visualisation within archaeology is not straightforward as the term can be interpreted differently dependant on the context of its creation and the purpose of its consumption. This chapter introduces visualisation on a broad scale, considering what defining factors constitute the different fields of visualisation, before outlining some of the different manifestations of visualisation within the field of archaeology. The chapter will then define the term 'visualisation' as it has been interpreted within the framework of this thesis and demonstrate how this work contributes to the wider and ongoing debate regarding image-making in archaeology.

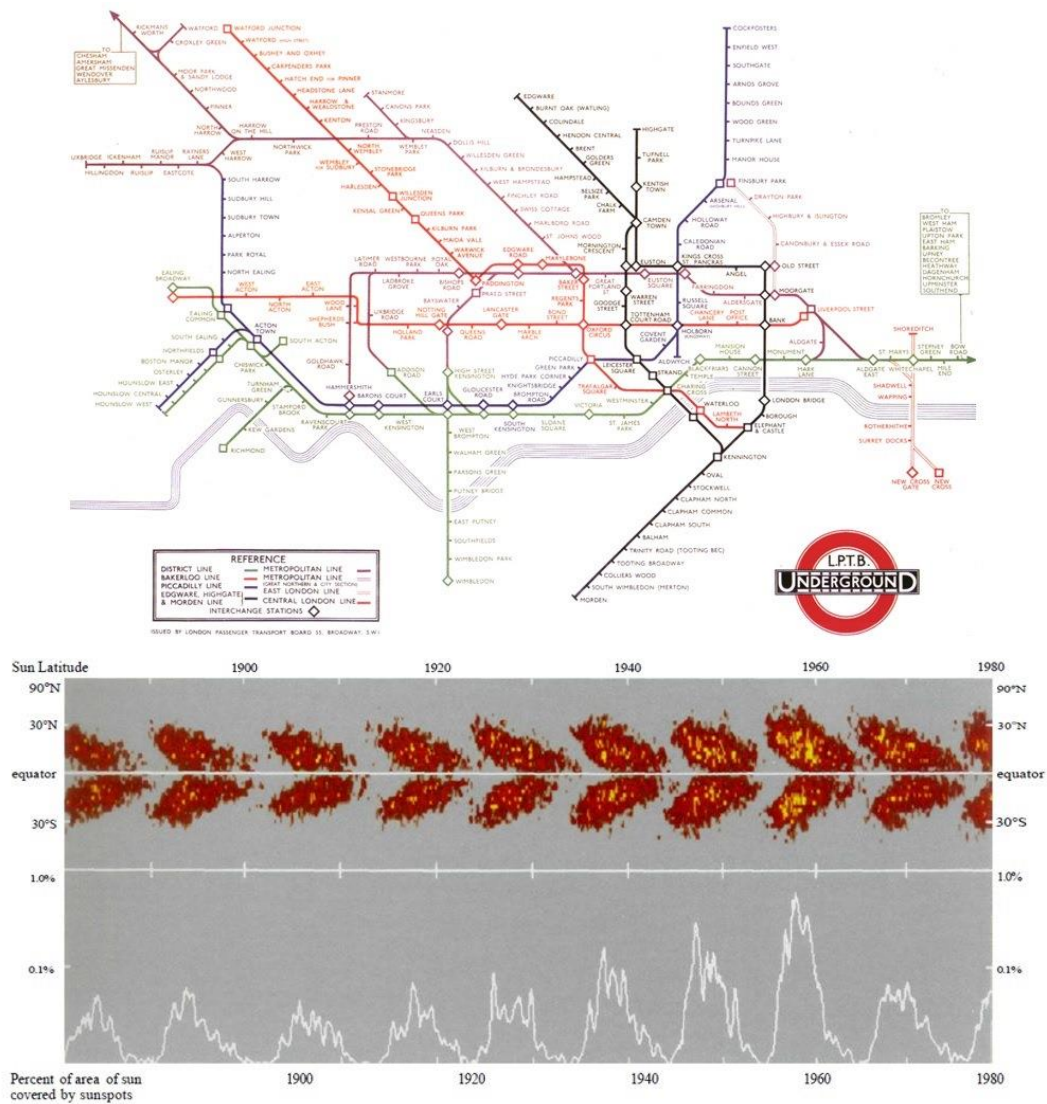
### 2.1 Introducing Visualisation

"To envisage information – and what bright and splendid visions can result – is to work at the intersection of image, word, number, art. The instruments are those of writing and typography, of managing large data sets and statistical analysis, of line and layout and colour."

Edward Tufte (1990, 9)

Visualisation constitutes the exploration, manipulation and representation of information in a graphic form with the aim of gaining insight into data. It is a process which engages the primal human sensory apparatus, vision, as well as the cognitive processing power of the human mind (Schroeder *et al* 1998, 1). Visualisation gained recognition as a formal discipline in 1987 with the publication of the paper 'Visualisation in Scientific Computing' by McCormick *et al* (1987). Since then the field has expanded significantly, with dedicated conferences such as the IEEE (Institute of Electrical and Electronics Engineers) and SIGGRAPH (Special Interest Group on Graphics and Interactive Techniques) which both have extensive published proceedings. Though the discipline was not formally recognised until 1987, visualisation practice has a rich history dating as far back as 1637 when Rene Descartes the French philosopher noted the crucial role played by diagrams in scientific research (Collins 1993).

Different types of visualisation can be defined by a number of attributes, from graphic appearance and technology used, to overall function and intended outcome. However, all visualisations share some fundamental attributes. For example, all visualisation is derived from the manipulation of data of some sort and is concerned with the exploration and analysis of that data or the presentation and communication of ideas and information, and often both together.



**Figure 2.1:** Some examples of visualisation. Top: Beck's London underground map (Spence 2001, 2) which uses abstraction as a means of communicating complex geographical information. Centre: a graph visualising sun-spot cycles (Tufte 1990, 23). Bottom: an example of three-dimensional interactive medical visualisation at the Digital Design Studio (reproduced with permission from the Digital Design Studio, Glasgow School of Art).

Many scholars have attempted to apply strict definitions to the various fields of visualisation. For example, Spence (2001, 3) has defined visualisation as being split between two broad spectrums; *information* visualisation and *scientific* visualisation. Information visualisation reduces abstract data or concepts into a representative graphic for the purposes of communicative clarity or to gain new insight into data. Well established examples of this include Beck's London Underground map (shown in Figure 2.1). Scientific visualisation tends to visually represent and manipulate entities or events which are physically present in the real world (Spence 2001, 4). Friendly (2009, 2) describes this interdisciplinary area as being primarily concerned with the visualization of three dimensional phenomena (for example architectural, meteorological, medical or biological), where the emphasis is on realistic renderings of volumes, surfaces, illumination sources, and so forth, often with a dynamic component such as time. Considered to be a branch of computer science, scientific visualisation aims to present data in a way which facilitates understanding, representation and insight (three dimensional models, animations and simulations for example, also shown in Figure 2.1).

Broadly speaking, under these definitions all forms of visualisation could be considered subsets of either information or scientific visualisation. However, in reality the lines of definition can blur or distort easily across different contexts and media. Tufte's (1990) approach to understanding visualisation is far more fluid and is structured around the various dimensional approaches to envisioning information and data. His work contemplates the various ways data from a variety of fields (science, astrology, statistics, geography, cartography etc) can be visualised in a way which avoids what he terms 'flatlands': the two dimensionality imposed by paper and screens (Tufte 1990, 12). Tufte does not try to delineate visualisation into different typologies, but takes each example as an individual case with its own unique context and objectives, basing its value on its perceived success in reviving the data into a coherent and multidimensional representation.

Typologies aside, visualisation plays a hugely important role in many academic fields as the immediacy of images makes for a powerful tool with the ability to communicate a large amount of information all at once. Both Jay (1994) and Jenks (1995) observe that looking, seeing, and knowing are inextricably intertwined, rooted in neurological and psychological links between visual perception, action and emotion (Nijland 2006). Thus images communicate in a different way to text and have the potential to evoke understandings in a manner which words cannot (Marion and Crowder 2013, 31). Whether visualising large datasets or complex interpretive information, visualisation is considered a research process in its own right within a number of disciplines as it often facilitates a two way interchange between practitioner and visual subject (Pink 2007, 21). For example, speaking from the field of design Garner (2008, 17) advocates the strength of visualisation as supporting a personal dialogue of enquiry and speculation whilst offering an opportunity for others to engage with ideas through the subsequent

representation. Despite these strengths, the social sciences and humanities in particular have undervalued visualisation, largely relegating its use to subsidiary illustrations accompanying text. This can be attributed in part to the fact that traditionally research and academic scholarship is logocentric, emphasising the written and spoken word. In recent years however attitudes have evolved and interest in visual methods in the social sciences has increased, realising the potential of these methods in providing a deeper and more subtle exploration of information, data, social contexts and relationships (Spencer 2011, 1).

### 2.1.1 Visualisation Workflows and Best Practice

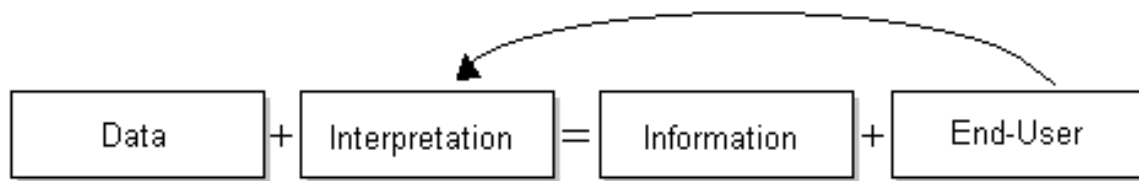
If the strength of visualisation is to be accepted not only in terms of its final graphic outcome, but as a process of reasoning in itself (Barceló *et al* 2000b, 3) then it is crucial to recognise the importance of the *process* and to document and understand it. Upson *et al* (1989, 32) advocate the use of computational models or workflows in order to develop a coherent picture of the various steps taken when generating and processing data towards a visual outcome. Different workflow models can be used as a reference for best practice in different disciplines, particularly in the more scientific or technically driven fields of visualisation, where systematic and regulated practice is often fundamental to the success of the visualisation process.

Source Data → Filter → Map → Render → Output Image

**Figure 2.2:** A typical visualisation workflow adapted from the Upson *et al* (1989, 40) model for computational visualisation.

As is demonstrated by Upson *et al*'s (1989) model (Figure 2.2) these workflows are typically rigidly linear in order to promote an objective methodology and repeatable results. The above workflow deals with different sequential stages in a typical visualisation process whereby information is generated and data is processed towards a final visual outcome. Each stage in the workflow is ultimately decided and its content influenced by the established needs of both the practitioner and the end user. This considered, frequent evaluation and reflexivity is also an essential part of the visualisation process and practitioner review should be encouraged at each stage as part of any research-driven workflow. This is demonstrated by Figure 2.3, which integrates user feedback into the workflow, thus breaking a linear pipeline into a process of circular adaptability which actively encourages reflexive thinking.





**Figure 2.3:** A visualisation workflow diagram reproduced from the Archaeological Data Service Guides to Good Practice on Virtual Reality (Ferne and Richards 2002).

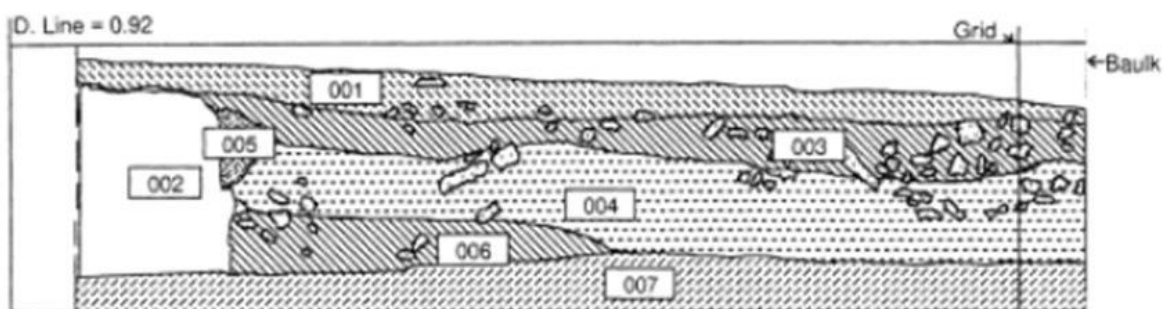
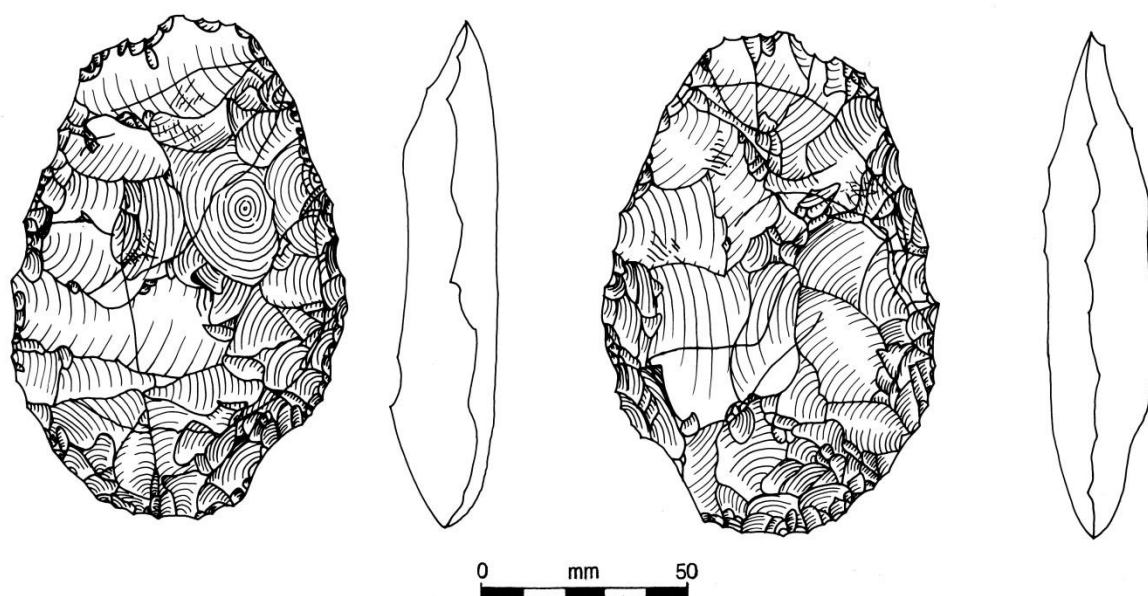
In practice, very few visualisation workflows are able to exist in a straightforward linear format. In the field of arts and humanities many of the subjects, theories and arguments of academic interest concern highly complex visual or spatial materials (Denard 2012a, 60) and these rely on an inherently non-linear interpretive process. One of the major advantages of visualisation is that it allows these complex cognitive processes to be expressed simultaneously rather than being divided into a sequential narrative. This is beneficial for communicating these complex datasets and theories, but complicates the documentation and quantification of the process. However, regardless of the field there are a number of important attributes which constitute a successful visualisation. Thus a visualisation should always:

- Be designed appropriately for the intended audience and context it will be shown in.
- Accurately represent the data or information without distortion.
- Remain clear and as such avoid trying to show everything at once within one image.

Though there are a multitude of avenues for visualisation these three broad guidelines should always be respected and wherever possible the process should be documented and subject to reflexive evaluation.

## 2.2 Visualisation in Archaeology

Archaeology is a visually rich discipline in which images are used to tell stories about data, the archaeological process and interpretation of the past. At its core, all image-making within archaeology involves implicit assumptions and explicit choices, but the context and technique behind the creation of these images and the ways they are consumed often obscure this process. Crucially, image-making (much like the process of archaeology itself) is something inherently subjective and creative. Within archaeology seven broad fields are defined here within the remit of visualisation practice: illustration, photography, spatial analysis, digital survey, reconstruction, simulation, and art. The following section will briefly outline these fields in order to provide a context for the use and discussion of visualisation within this thesis.



**Figure 2.4:** Top: an example of lithic illustration drawn to standard conventions (author). Bottom: an example of a stratigraphic section drawing showing the vertical relationships between deposits in an excavation trench (Banning 2000, 259).

### **2.2.1 Illustration**

Archaeological illustration is a form of technical drawing which aims to provide an accurate and detailed record of a subject in a consistent way (Banning 2000, 277). Whether a measured artefact illustration or an excavation plan or section drawing (see Figure 2.4), these images are drawn to specific conventions which often highlight information (such as soil texture or material) in an abstracted style, emphasising select information and embedding meaning into graphic form in a way which a photograph cannot. For artefact illustration illustrators generally work in pen and ink to produce the initial drawing, then move to graphic software to finalise the image for publication. For survey-based illustration (for example, excavation planning, stratigraphic section drawing or standing building survey) archaeologists use a range of equipment including tapes, plane-tables, total stations or laser scanners, GPS and GIS to produce plans, sections, elevations or three dimensional models.

Illustration can be considered as a product of the archaeological process. Artefacts are singled out to be drawn for publication and plans believed to be of particular significance are drawn for publication. In this sense, illustration focusses and distils the fieldwork process into conclusive accompanying material. This process may seem routinely linear and on some level transparent but as any seasoned illustrator will know these images are often the result of drafting, reflexive discussion and revisions to make particular details more apparent and obscure others. These predominantly silent choices shape what we make and how this material is received.

### **2.2.2 Photography**

Photography has a long standing relationship with archaeology, forming an essential part of the fieldwork record through the documentation of excavations, landscapes, sites, structures and artefacts (see Figure 2.5). Archaeological photography relies on trained skills and techniques in manipulating lighting, camera settings and framing visual information in order to communicate detail from a range of scales and perspectives (e.g. landscape to artefact). Furthermore, photogrammetry (the practice of making measurements from a photograph, usually by collecting multiple images which can be stitched together to produce a map or 3D model of something in the real world) has greatly enhanced the possibilities for three dimensional artefact and site documentation in the field of archaeology (see Figure 5.8 in Chapter 5 for example). The visualisation of multiple perspectives and scales becomes a recurring theme in the case studies discussed later in this thesis and the majority of these perspectives have been facilitated or enhanced by different types of archaeological photography from the air to the ground.



**Figure 2.5:** Top: Lithic photograph with scale (Fisher 2009, 4). Bottom: Excavated section photograph from the 2013 Castle Law excavations (Poller2013).



**Figure 2.6:** Some examples of somewhat more unconventional archaeological photography. Top: photograph by Robert Rohe taken during a project intended to record not just the excavations but the excavators themselves, engaged in their work. Bottom: photographs by Ryan Stander which were intended to capture and communicate a sense of environment, process and day-to-day lived experience on site. (Photos online at <http://archaeologistsphotographers.wordpress.com/>).



Within archaeology photography is often perceived as being an objective and neutral means of preserving and recording a snapshot in time due to its optical consistency (Van Dyke 2006, 370). However, in reality photographs cannot truly provide this kind of transparency because the process of taking a photograph always includes a series of technical decisions (for example, aperture, depth of field, focus) and choices relating to framing and, by association, exclusion. For example, Bateman (2005, 194) explains that photographs routinely taken as part of the excavation process make conscious exclusions by removing the people and tools which excavated it. These staged images he argues are presented as an unhindered 'archaeological reality'. It is in this same light that Bohrer (2005, 182) states that photographs do not passively document, but actively claim an interpretive position.

Additionally, a number of archaeologists have used photography to supplement the excavation process and archaeological record for a site by taking photographs of the process itself (see Figure 2.6). These photographic studies aim to capture moments of action and the experience of excavation. Michael Shanks in particular has done a great deal of work in this area, believing that photography and archaeology share similarities in process, materiality (see Edwards and Hart 2004) and engagement (Shanks 1992, 144-145) and both reflect deeper understandings of our experience and imagination (Shanks 2012). For example, an archaeologist chooses what to excavate, record and display according to the nature of the site and the requirements of the target field of study (or academic audience) while a photographer makes exclusive choices directly influenced by the nature of the subject and the story they wish to tell to their audience.

### **2.2.3 Spatial Analysis**

The practice of spatial analysis concerns the examination and comprehension of spatial patterns of entities in geographic data as they appear in relation to each other. Spatial analysis is a vast field utilised by many disciplines, not specifically within archaeology. The field was initially founded by geographers then integrated into archaeology in the mid-1970s. In archaeology today spatial analysis is usually studied by means of a software application (for example ArcGIS) which can be used to evaluate geographical or topologically based archaeological lines of enquiry. For example, speculative least-cost pathway analysis, view-shed analysis between sites and natural landmarks, and to investigate site location in relation to wider environment.

This mode of archaeological visualisation is often associated with the study of landscape archaeology which in itself is a mode of archaeological investigation which recognises that many of the material consequences of human behaviour are ephemeral in nature and do not conform to the standard definition of 'sites' (Bahn 2001, 355). Instead, it focusses on the distribution of evidence for human activity across a landscape and the interrelationships between sites and the spaces between them

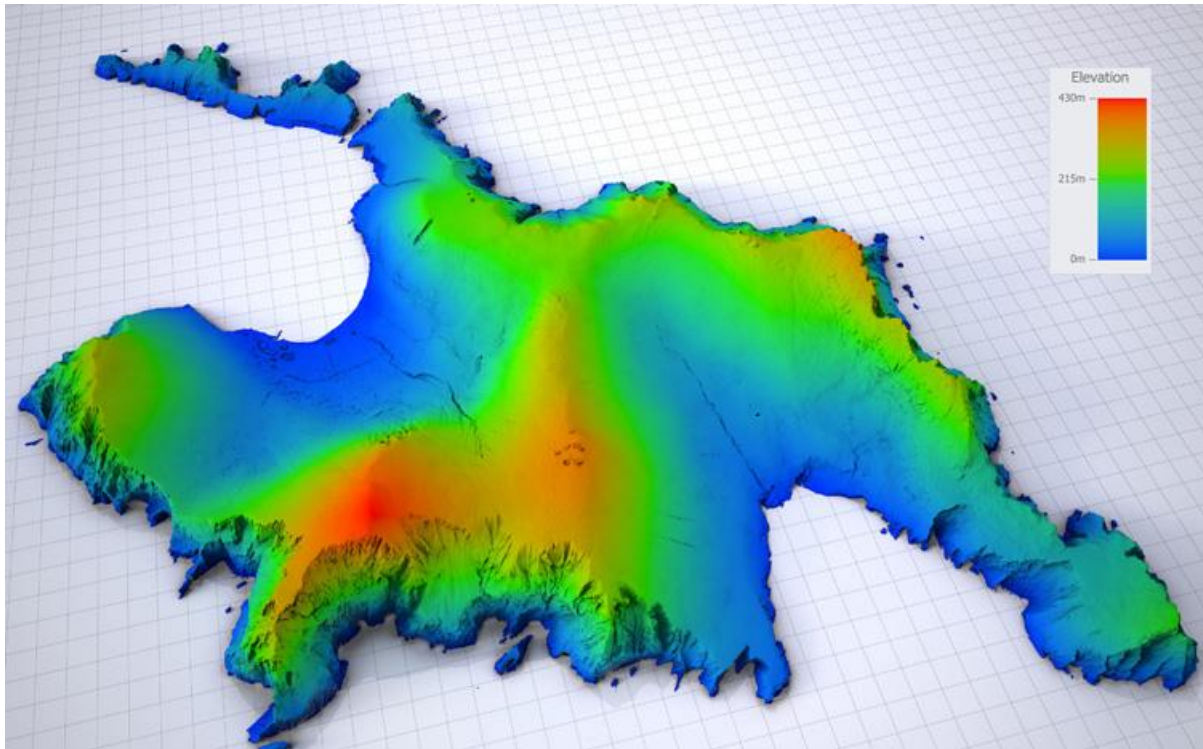
(Chapman 2006, 11), avoiding viewing sites in isolation from one another. In the field of archaeological visualisation this perspective is important to consider because often the nature of traditional 'reconstruction' (to be discussed below) can result in archaeological sites being represented in isolation of their wider landscape context. This disproportionate representation can be problematic as it reduces sites and structures to simplistic modular entities.

#### **2.2.4 Digital Survey**

Data visualisation following survey or data capture in the field is discussed here in its own right, though its various implementations inform the other fields of archaeological visualisation such as illustration and reconstruction. Generally speaking, data visualisation concerns the abstracted visual representation of spatial information (often three dimensional) collected by automated electronic machinery, for example total station or laser survey equipment (see Figure 2.7 for examples). Take laser scanning as an example: three dimensional survey data captured in the field by the machine is then uploaded to a computer which uses specialist software to visualise the data. The software translates this collection of individual data entries into an abstracted representation of the survey subject, resulting in a three dimensional point cloud. This point cloud data can then be further manipulated using a variety of complex algorithms which produce a surface representation, or mesh, of the survey subject which can be utilised and further manipulated by additional visualisation processes, such as interpretive visualisation or spatial analysis (a detailed description of this process can be found in Chapter 4).

Digital survey has almost entirely replaced the more traditional manual forms of survey in the field. The advantage of digital over manual is that it systematically facilitates the rapid capture of highly accurate spatial data using a methodology which is repeatable (perhaps with minor alterations) for every archaeological site. However, as this research will go on to demonstrate, the use of systematic and automated digital survey techniques can have a negative effect on the interpretive process as it mediates and mutes practitioner engagement with the site or artefact.

Digital survey may be presented as an objective means of data capture and representation but this is due to a false sense of neutrality and transparency. In reality, much like photography and illustration (for example, Berger 1982, Gosden 2004 and Shanks 2012), it involves a series of technical decisions and choices which single out sites, structures, and objects for display.



**Figure 2.7:** Examples of three-dimensional digital survey of St Kilda in the Outer Hebrides. Top: aerial LiDAR survey data (reproduced with permission of the Centre for Digital Documentation and Visualisation (CDDV)) and bottom: terrestrial laser scanning in Village Bay (photo by Mike Brooks).



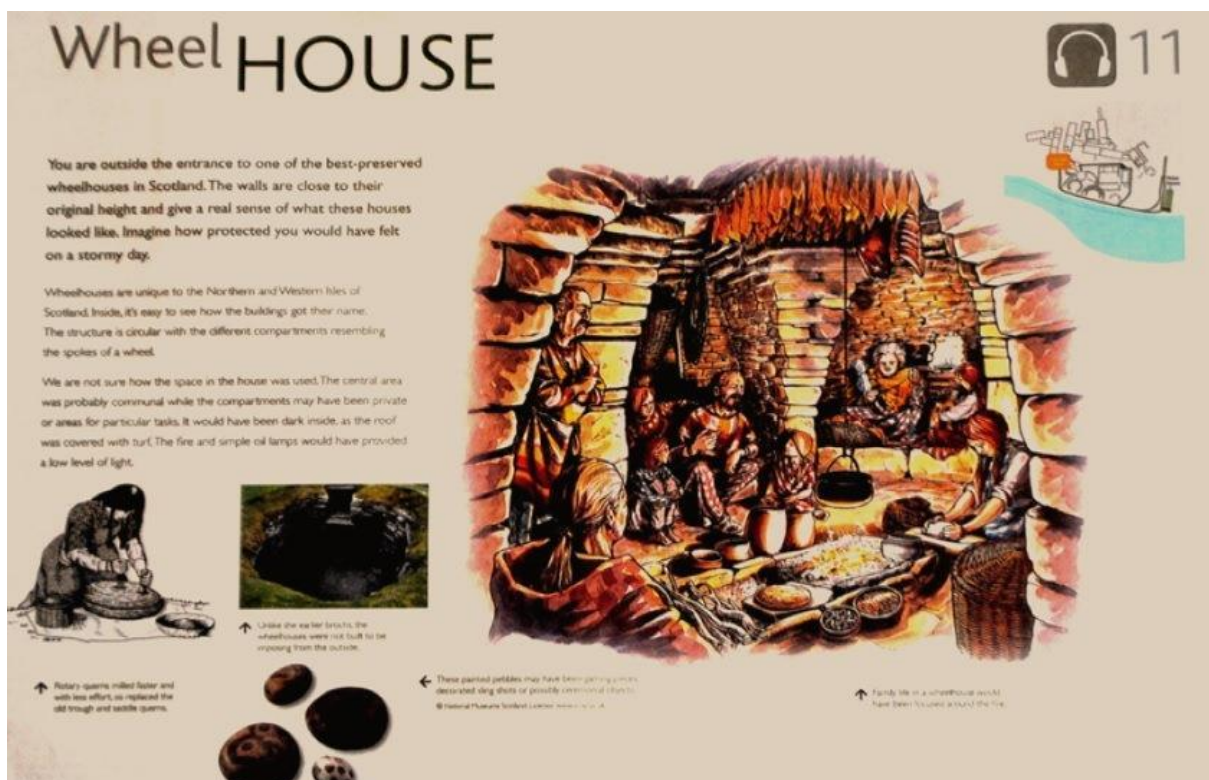
### 2.2.5 Reconstruction

The term 'reconstruction' is often discouraged in current practice as it can be taken to imply a level of interpretive certainty which is largely unobtainable. Reconstruction *is* a loaded term in archaeology and many (for example, Bradley 1997, Swogger 2000, Smiles and Moser 2005) have laid bare the numerous societal conditions and constitutive interests which unavoidably shape these depictions of life in the past. These engaging images should not be viewed as conduits to life in the past due to the fact that all reconstruction images depict the past in the present, a present largely shaped by specific circumstances of production within an explicit time, place and sociocultural setting (Molyneaux 1997, 3). In this sense these representational images can be viewed as highly seductive, serving to strengthen existing understandings, preconceptions and beliefs (Molyneaux 1997, Smiles and Moser 2005, Van Dyke 2006). What is more, these images often seem to transcend time and scholarship by becoming 'fixed' in the minds of their audiences (Molyneaux 1997, 6).

Despite these issues, archaeologically informed reconstruction remains a valuable (though much debated) field in archaeology and spans both expert audiences and general public dissemination and outreach alike (Figure 2.8 demonstrates the typical presentation of reconstruction images on heritage sites in the UK). Traditionally referred to as the 'artist's impression', reconstructions typically present a site or artefact as it may have appeared in the past, often going even further to depict an imagined scene of activity by placing artefacts and components of material culture within the interpretive context of their use. Reconstructions can range from being largely speculative in nature to being almost entirely grounded in empirical data (Mudge 2012, 178) often resulting in an unusual combination of science, narrative reconstruction and storytelling.

On a broad level reconstructions play a hugely important role in heritage fields as the immediacy of these images means a great deal of complex environmental, structural and social information can be communicated simultaneously. In line with the broad characteristics of what constitutes a successful visualisation archaeological reconstructions are produced to be easily relatable and readable and are unique in that the same image can span a multitude of contexts from academic papers to visitor centre information boards while remaining accessible and understandable to everyone within these varied audiences.

Traditionally reconstructions were commissioned by archaeologists and completed by artists and although this is often still the case in a public heritage context, the increased popularity and availability of software for digital modelling and rendering over the course of the past decade has seen a rise in the number of archaeologists producing digital models and reconstructed scenes themselves.



**Figure 2.8:** Examples of the format of reconstructions most people will be familiar with when visiting heritage sites in the UK (images reproduced with permission from Historic Scotland).

As a result of this the field of archaeological reconstruction developed into a field of virtual archaeology which was initially believed to be of a more scientific nature than the traditional ‘artist’s impression’ due to its computational origins and the archaeological research context within which the majority of these images were being produced. This gave way to a large body of critical literature concerning the production, analysis and dissemination of digital reconstructions which document recurring theoretical critiques and issues with the use of reconstruction within academic archaeological practice (discussed in detail in Chapter 3). This problematic history of the way archaeologists have used reconstruction images coupled with their ongoing unengaged production and dissemination has resulted in a series of deeply embedded expectations about what these compelling visuals *can* and *should* do.

### 2.2.6 Simulation

Simulation is still an emerging field in archaeological computing though notable examples include agent-based modelling applications and serious gaming platforms. Agent-based modelling involves a set of artificial agents carrying out a series of tasks in a computer simulated environment and is used to explore complex process driven phenomena, while serious gaming relies on user interaction with a simulated environment. Examples of serious gaming include the digital reconstruction of Rome in *Rome Reborn*<sup>1</sup>, an archaeological initiative headed by Bernard Frischer, the ongoing *Open Virtual Worlds* project run by the University of St Andrews (Kennedy *et al* 2013) and the interactive and highly anticipated Bannockburn Centre<sup>2</sup> which opened in 2014 in Stirling, Scotland.

These examples hint at the developing potential of interactive platforms for academic collaboration and public engagement. Here, storytelling is adapted to a dynamic format which arguably gives the user a sense of self-led discovery and exploration. Though this form of engagement may engage its audience in a different way to more traditional formats, ultimately the same stories unfold and the information ascertained is largely pre-determined by the developers.

### 2.2.7 Art

An important area which skirts the edges of archaeological visualisation can be loosely characterised as art. Archaeology has a long history of inspiring art and recently there has been an increased interest in the collaborations between art and archaeology (Renfrew 2003, Renfrew *et al* 2004, Schofield 2006, Bailey 2008, O’Connor 2008, Russell 2008, Edmonds and Ferraby 2013, Russell and Cochrane 2014). This is a dialogue that works in either direction as there are notable examples of artists working with archaeological material and concepts (Dion and Coles 1999, Callery 2004, Vilches 2007, also see Figure

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<sup>1</sup> Accessible online at <http://romereborn.frischerconsulting.com/>

<sup>2</sup> Preview online at <http://battleofbannockburn.com/>

2.9) and of archaeologists being inspired or informed by artists in their interpretations (Tilley *et al* 2000, Renfrew 2003, Watson 2005, Bailey 2008). Art is an important area in the field of archaeological visualisation because the interdisciplinary nature of its integration can often be revealing for the processes of interpretation, offering a different or complementary view on complex visual information by unhinging philosophical concepts and moving them in new directions (Broglia 2011, xvii). Art is reliant on exchanges between artist, subject and audience and as such can be regarded as a social process (Waterton and Watson 2010, 4-5), thus images which result from creative practice are more than simply pictures, they are a way of acting, identifying and being as well.

As this thesis will go on to demonstrate, creative practice has the potential to facilitate dynamic engagement with the archaeological record, representing a powerful means of interpreting the past in the present (Tilley, Hamilton and Bender 2000, 35) and of expressing different accessible understandings of being in the world (Cochrane and Russell 2007, 5). In many ways art is the least engaged with yet most honest form of image-making within archaeology because it does not attempt to mask its creativity and subjectivity from its audience. However, in many archaeological contexts the concept of “art” has been poorly defined and consequently the perception of its use is varied, often being thought of as “good to look at” as opposed to being “good to think with” (Cochrane and Russell 2007, 5).

Artistic method does not share the same boundaries as archaeological practice though often their processes of production share compelling similarities. Ben Haggarty and Adam Brockbank’s graphic novel *Mezolith* (2010, see Figure 2.10 for select extracts) and Margaret Elphinstone’s fiction *The Gathering Night* (2010) are such examples of works of creative fiction which demonstrate these parallels. *The Gathering Night* and *Mezolith* were extensively researched in order to ground them within archaeological evidence and theory on Mesolithic life and both stories blend evidence for material culture and migratory patterns with ethnographic folklore and belief structures. What ensues from this mode of representing the past is an incredibly rich visual and creative narrative with a very strong sense of human agency. Elphinstone in particular worked closely with archaeologist Caroline Wickham-Jones and in addition to the novel the two wrote a co-authored paper recounting their experiences from the perspective of the author and of the archaeologist. While Elphinstone researched her story, Wickham-Jones found herself reflexively thinking about her usual interpretive process in the field,

“It occurred to me that I had never tried to make my idea of Mesolithic life actually work. The process of supplying a platform to the novelist made me aware of the weaknesses in my archaeological theory and interpretation”

(Elphinstone and Wickham-Jones 2012, 536)





**Figure 2.9:** Both Richard Long (top: *A Line Made by Walking* 1967) and Anthony Gormley (bottom: *Another Place* 1997) engage with archaeological concepts of time and materiality through artistic practice. Long's art represents an essence of his experiences (Long 1983) and leaves behind traces of himself and his process in his final work (Renfrew 2004, 14). Similarly, Gormley's sculptural work was made to be ephemeral and to become altered and weathered by the environment, much like archaeological materials (Gormley 2004).





Figure 2.10: Select pages from Haggerty and Brockbank's graphic novel *Mezolith* (2010).

Thus a creative process made space for a reflexive dialogue to open between artist (in this case a novelist) and archaeologist. Examples like *Mezolith* and *The Gathering Night* are important to consider as they successfully explore the more intangible side of prehistoric life; ritual, belief systems, social structure and so forth to a greater depth than would usually be feasible within traditional archaeological discourse.

## **2.3 Interpretive Visualisation**

Images in archaeology are a powerful communicative tool; they can be objective, scientific and data driven as well as subjective, emotive, provocative and artistic, and any manner of things in between. The visualisation used within this thesis does not sit comfortably within a strict definition but fluidly shifts across an objective-subjective spectrum, at once exploiting and exploring the expectations at either end of this imagined scale. In practice the lines between the areas of archaeological visualisation defined above can be blurred, distorted and challenged by the context of a particular image.

The visual work produced as part of the case studies in this thesis vary considerably in their method and their place in the spectrum of archaeological visualisation. However, what they all share in common is their contribution to telling stories about the past in the present. Some simply present a digital surrogate for the site as it stands today, while other approaches employed by the author and collaborators push the visuals into extremely subjective and speculative territory. As such, it would be short-sighted to attempt to define its use in this thesis by media alone. Rather more productive is a definition based on its objectives, methodologies and context for consumption. The images and animations produced as part of this thesis are research driven, which is important because it contextualises the visualisations within a framework of archaeological practice. The research makes use of a multitude of imagery, for example photography and film are used in collaboration with animated digital representations of the same site.

The author's visualisations are informed by the archaeological record; site plans, survey data and excavated material culture form the context upon which to build a communicative and discussion provoking visual interpretation. Though artistic methodologies are embraced they do not define the work. As such, the visual outputs are not a work of fiction, nor are they a fixed truth; instead they operate within the space interpretation can occupy while still responding to the evidence.

The visualisation used within this thesis cannot be defined solely within any one of the seven areas discussed earlier as multiple approaches and methodologies are utilised and combined within the case studies to produce the final visual outcomes. As such, work produced as part of this thesis (where not specifically referring to a particular technique) will hereby be referred to under the umbrella term of

archaeological ‘interpretive visualisation’. Thus, archaeological ‘interpretive visualisation’ is hereby defined within this thesis as:

*The communication of archaeological information and/or interpretation which has been manipulated in order to be presented in a graphic form, either as a representation (which can be two or three dimensional, realistic or abstract) or as a means of the effective communication of a complex idea or theoretical debate.*

The work discussed in this thesis represents a contribution to the ongoing debate within the wider field of image-making in archaeology by developing a practice-led approach which avoids using singular methods of visualisation in isolation. The research draws upon and blends together a range of the methods described in this chapter and rather than attempting to mask elements of subjectivity, actively and reflexively engages with the creativity, interrogating the process in order to validate its significance as an important part of archaeological practice.

## **2.4 Summary**

This chapter has demonstrated that within archaeology there are a number of different areas of visualisation which differ in their medium, scale and the context for their use. However, regardless of medium or technique, archaeological visualisation can be thought of as always having the key purpose of being a conduit to the representation, interpretation and communication of the archaeological record. Fundamentally, all archaeological visualisation involves a series of (often pre-determined) choices which single things out for display and dictate the context within which they will be consumed.

Visualisation has been introduced from a broad perspective and narrowed down to a disciplinary specific scale. Thesis-specific use of the term was defined as archaeological ‘interpretive visualisation’. Although a multitude of visualisation fields and subsets exist all visualisation concerns the exploration (analysing data to generate new information) and/or explanation (conveying data or information to an audience) of data or information. In order to be considered an ‘interpretive visualisation’ within this thesis an image or series of images must constitute the representation of data or information which has been manipulated to produce a visual for a pre-determined aim.

The next chapter will outline the development of visualisation in archaeology, its present role in this field of research and the established arguments for critiquing this type of work over a number of contexts.



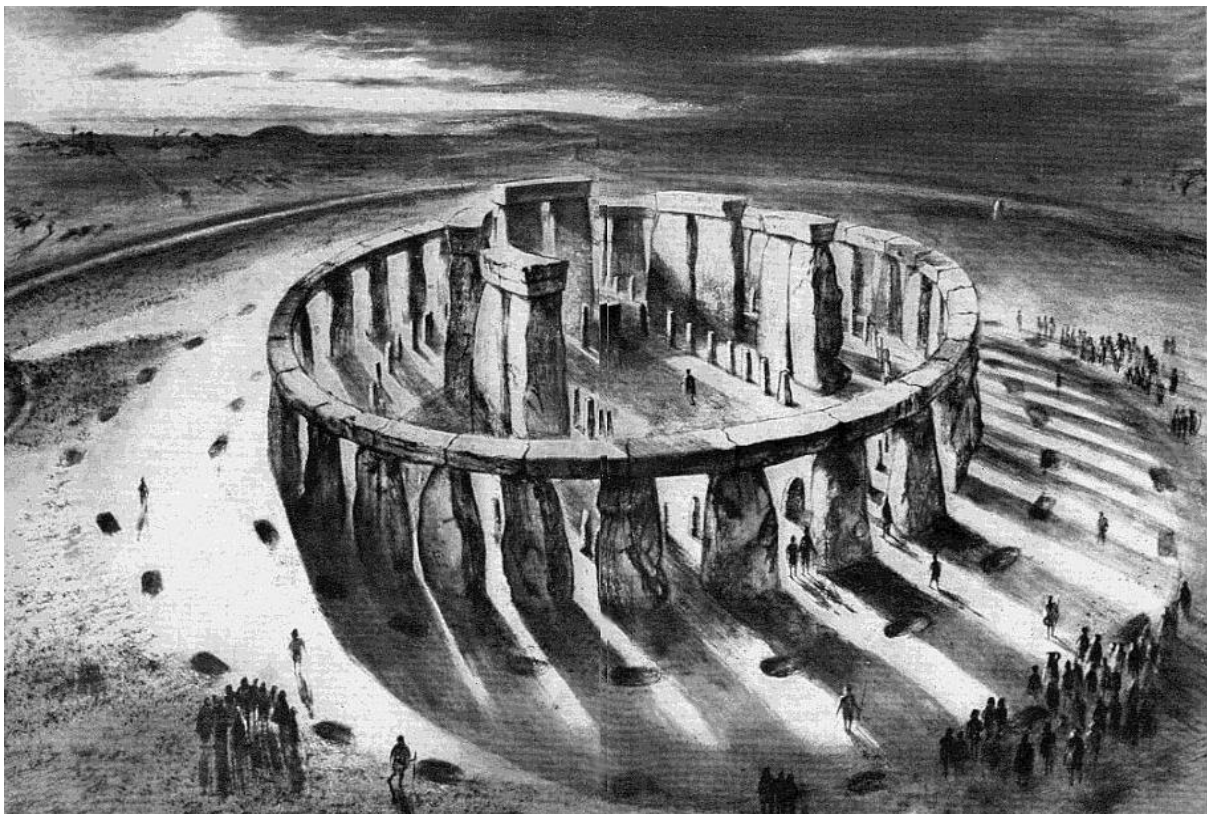
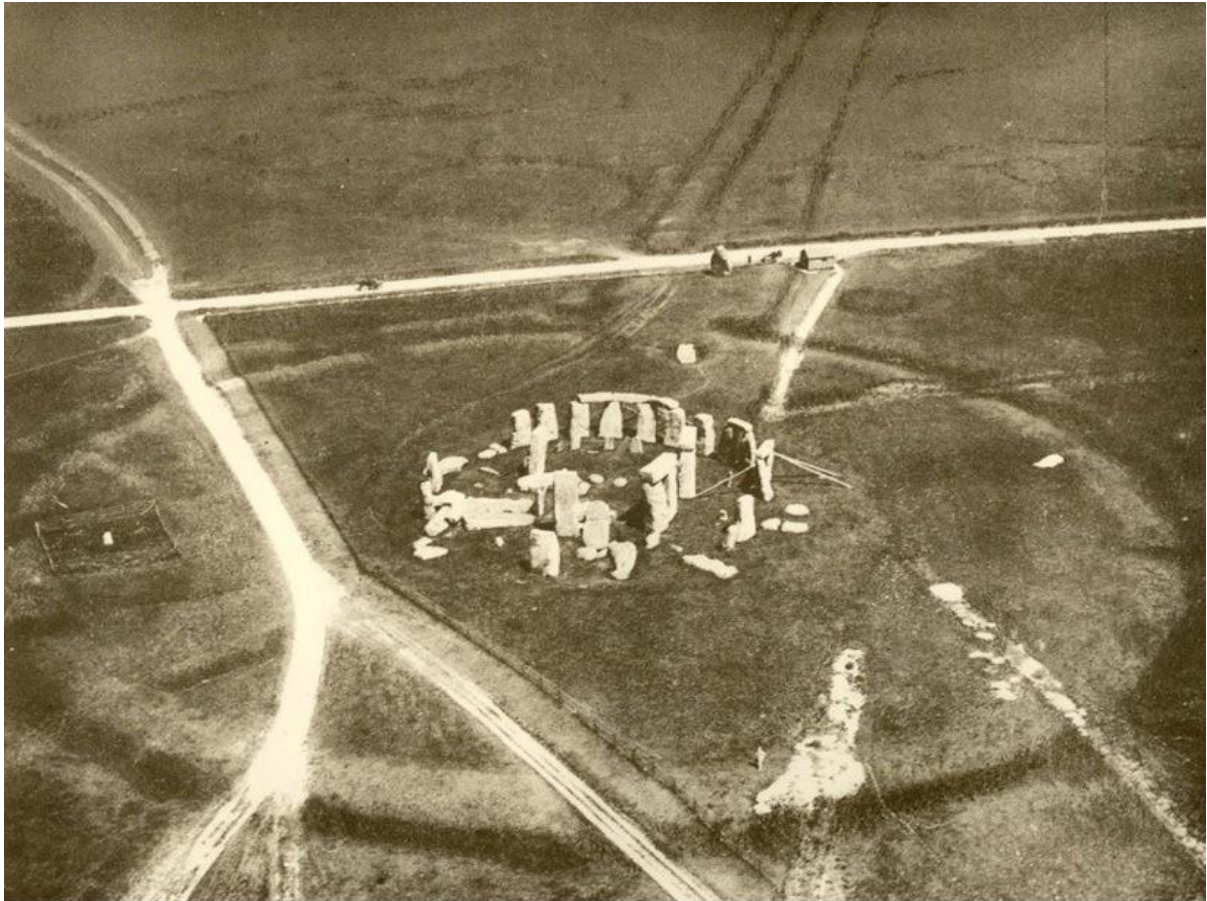
### **3 Images as Research: A Review of the Field**

This chapter will outline the development of visualisation in archaeology, its present role in this field of research and the established arguments for critiquing this type of work over a number of contexts. Drawing upon a series of key debates and scholarly work to date it will demonstrate the depth and richness of the current discussion on visualisation in archaeology and establish the intentions and context for conducting this research.

#### **3.1 A Brief History of Visualisation in Archaeology**

The earliest recorded illustrations of archaeological sites and artefacts occur in medieval manuscripts from northern and western Europe, though the styles of archaeological illustration most people are familiar with today have their roots in the Renaissance period with the rise of scientific study and a realisation of a need for measured drawings to aid in classification (Adkins and Adkins 1989, 1-2). However, many of these images retained somewhat picturesque characteristics and it was not until the publication of Pitt-Rivers' work in the late 19<sup>th</sup> century that illustration for archaeology really matured as a practice (Piggott 1978, 53-55). During the 20<sup>th</sup> century modes of graphic representation in archaeology diversified as the discipline itself grew and became subject to the influence of new ideas and techniques. The practice of photography for example expanded into aerial photography from balloons, kites, and light aircraft (Barber 2011) as new perspectives of archaeological visualisation were realised (see Figure 3.1). The advent of the 'archaeological reconstruction' was largely championed by Alan Sorrell from the 1950s onwards (Sorrell 1978) and it is with the format of his iconic 'birds-eye' illustrations most people will be familiar. The new wealth of possibilities for visualising the archaeological record led to an increased awareness of the strengths and weaknesses of each medium (Adkins and Adkins 1989, 5). In turn this awareness stimulated an increasingly self-reflexive approach towards the intended purpose and impact of any given visualisation and an emphasis on the adoption of principles for good practice, particularly with measured drawing.

The mid 1980s and early 1990s saw the rapid uptake of digital technologies for the analysis and presentation of archaeological data and information. The advent of spatial analysis and Geographical Information Systems (GIS) (Allen *et al* 1990) concerned cultural resource management and landscape analysis (Gillings and Wise 2011) and facilitated such possibilities as predictive modelling, least cost pathways and view-sheds (Kohler and Parker 1986). As GIS was advancing into a mainstream practice, the likes of Tilley (1994) were championing a phenomenological approach which advocated that meaning was culturally embedded into the landscape.



**Figure 3.1:** Top: Sharpe's 1906 aerial photograph of Stonehenge taken from a balloon (Barber 2011, 35). Bottom: An artist's impression of Stonehenge by Sorrell (Atkinson 1959).

Archaeologists became increasingly aware that simply identifying intervisibility between monuments and archaeological sites alone could not produce a conclusive answer and that the application of purely quantitative tools such as GIS should not be expected to decipher complex experiential and social meanings from the archaeological record (Gillings and Wise 2011). Thus the integration of virtual reality modelling to allow for a more phenomenological and experiential approach to engaging with the interpretation of archaeological sites and landscape was advocated (Gillings and Goodrick 1996). The introduction of virtual reality technologies in archaeology facilitated two major approaches to visualising the archaeological record: modelling the real world and abstract visualisation (Ferne and Richards 2002). Modelling facilitated such scenarios as ‘rebuilding’ long destroyed buildings in a virtual environment, while abstract visualisation allowed the visualisation of large amounts of data to be manipulated and explored. Reilly (1991) is credited with coining the term “virtual archaeology” (Ryan 2001, 245), a concept which not only saw hypertext, multimedia and solid-modelling as a tool for the management and analysis of the archaeological record, but as a tool which transcended the simple description of graphic visualization techniques, ultimately pushing archaeology towards its next scientific stage (Pujol-Tost 2008, 101). In the years that followed, however, Reilly’s (1991) idea of a ‘virtual archaeology’ did not develop in a way which transformed archaeological practice, as he had expected it to (Pujol-Tost 2008, 101). Instead, the traditional concepts of archaeology were reinforced by the use of virtual reality technologies.

In many ways, from the mid-1990s onwards the practical application of interpretive visualisation in archaeology largely stalled. Though technology continued to advance, with the development of visual data capture techniques such as photogrammetry and laser scanning rapidly supplementing or replacing more traditional approaches to archaeological survey and data collection, methodologies behind the creation of archaeological visualisations remained unchanged. Zubrow (2006, 11) observes that in academic discourse technological development often results in theoretical adaptation of the field. However, in archaeology theoretical adaptation was slow to develop as the technological developments were largely external (Pujol-Tost 2008, 102-103). Technology, media and methods were being developed within other disciplines, then later being adopted into archaeology and incorporated with existent methodologies and practices, with little attempt to develop adaptive new epistemologies (Lull 1999 and Scollar 1999).

Digital developments were viewed as being fundamentally methodological, providing a set of tools comparable with any other in the archaeological toolkit (Zubrow 2006, 11) and archaeology continued to apply them to every possible aspect of research (Katsianis 2012, 51). This meant that new techniques and approaches to visualisation within archaeology only influenced data gathering and site management (Pujol-Tost 2008, 103) but had relatively little impact at a higher analytical level which would impact a

change in the wider theoretical debate. Use of these techniques at only a basic analytical level meant that for a long time archaeological computer graphics existed without critique or adequate theoretical explanation (Earl 2006, 192) often seen to represent a “virtually real past” (Ficher *et al* 2001, Forte and Silotti 1997, Miller and Richards 1994). This resulted in computer graphics being consumed from a less critical standpoint than the traditional hand-drawn ‘artist’s impression’ because of the perception of an association between computing and objectified science (Earl 2006, 194). Earl (2006, 194) notes that consequently a great many archaeological visualisations were viewed as being graphical externalisations of data held in a computer, digital duplicates capable of conveying objective facts, when in reality many of these reconstructions were products of a far less interpretively rigorous process than that of Sorrell (1978) or James (1993) whose work in contrast combined uncertainty, the nature of archaeological evidence, emotion and professional responsibility.

Throughout the late 1990s and 2000s archaeological literature concerning not only the application of computer graphics but also the convergence between art and archaeology (Renfrew 2003, 2004) wrestled with the process of reconstruction and visualisation in terms of their relationship to archaeological activities and the interpretive process (Earl 2006, 191) and these issues remain largely unresolved today. The possible ways in which artistic practice can inform archaeological enquiry has been approached by a number of authors in the last decade (Tilley *et al* 2000, Renfrew 2003, Watson 2005) in terms of its potential to facilitate dynamic engagement with the archaeological record, representing a powerful means of interpreting the past in the present and transforming our understanding of place and space (Tilley, Hamilton and Bender 2000, 35). As noted in Chapter 2, art is fundamentally reliant on exchanges between the artist and the subject, and between the art and the audience (Marion and Crowder 2013, 15) and is as much about the artist themselves as it is about the subject of the creative endeavour (Long 1983, Renfrew 2003 and 2004).

Today, illustrations and modes of visualisation remain one of the fundamental means for archaeologists to share evidence and visually play out their theories (Pillsbury 2012, 1). Representation has become widely accepted as a core component of heritage studies under the remit of such avenues as museology and interpretation studies (Merriman 1991, Hooper-Greenhill 1995, 2000). Though some would argue that little effort has been made to afford visualisation a dedicated focus of academic scholarship (Waterton and Watson 2010, 1) as mentioned in the previous chapters there does exist a small number of specialist conferences and university departments dealing with this field. The remainder of this chapter will consider the role of archaeological visualisation in the field today in terms of its theoretical context, applied best practice and the problematic preconceptions of its present use.

### 3.2 Establishing a Context for Visualisation in Archaeology Today

Before the 1970s the reconstruction of culture histories and life ways were the priority of archaeological scholarship, followed later by the addition of cultural processes and then with post-processualism, the reconstruction of meanings (Zimmerman 2008, 184-185). Post-processual theory initially developed as a response to disillusionment with the ability of a culture historical and processual archaeology to present a humanised, expressive, veristic, realistic and ascertainable past (Cochrane and Russell 2008, 9). In effect the discipline saw a shift from the study of abstract systems, such as economy and social structures, towards an increased consideration of materiality and human lived experience. By the 1990s archaeologists had begun to explore the experiential character of material culture (Gosden 1994, Tilley 1994, 1996, Thomas 1996, Jones and MacGregor 2002) and this increased interest led many to encourage a more embodied consideration of past materialities (Gilchrist 2000, Hamilakis 2002), with a greater focus on body, emotion and the senses and a sense of being and dwelling within sites and landscapes. This in turn advocated an appreciation of the senses in archaeological methodologies (MacGregor 1999, Watson and Keating 1999, Jones 2001, Hamilakis 2002). Following on from these trends in archaeological theory, there was an increased interest into the importance of representation and visual communication (Molyneaux 1997, Moser 1998). Archaeologists today remain divided between traditional culture historians who remain largely descriptive in their practice (defining people in the past into cultural groupings based on their material culture) and those whose work adheres to a largely post-processual methodology. Post processual methodologies concern social themes of agency, materiality, symmetry, phenomenology and representation (Hodder 2012, 7) and it is largely within this theoretical field that the research within this thesis has been conducted and discussed.

As a discipline, archaeology occupies a middle ground somewhere between science and the arts and humanities (Jones 2002, 1), a position which affords a mixture of objective and subjective methodological approaches to the interpretation and representation of the past. For example, post-processual method is interpretive, deconstructive and structures its interpretations around narratives, while archaeological survey methods (i.e. digital approaches) are analytic, reconstructive and measured (Zubrow 2006, 17-18). These contrasting approaches are often opposed in the literature (Jones *et al* 2011, xxvii), with some going as far as to suggest that post-processual theory and digital technologies are altogether incompatible (for example Whitley 1998). As Zubrow (2006, 18) observes, the subjects of art, insight and belief, favoured by post-processual theory, do not follow algorithms. Thus, this perception of incompatibility is fundamentally down to many post-processual processes of interpretation being difficult to quantify in the same way as measured survey or digital data capture.

The idea that pictures can convey a thousand words is familiar to most, but in practice this is a complex notion. Though an image may convey a thousand words, a good visualisation often requires a thousand words to describe it (Turner 2012, 139). As noted in Chapter 2, showing many things at once is a tremendous strength of visualisation which reflects the multidimensional nature of lived experience (Marion and Crowder 2013, 31), a reality which is often impossible to communicate through a textual narrative. However, in archaeology images by themselves cannot always convey everything the artist or archaeologist has intended and as such often run the risk of being misunderstood. Although visual representations bear an important relationship to academic practice, they cannot entirely replace words in theoretical discussion. This is not to say that images and words cannot play an equal role in academic work (Pink 2007, 6) but simply illustrates that any notions of 'pure image' and 'pure word' are not always viable in archaeology (Crawford and Simonsen 1992, 66), where viewers often need explanatory context in order to understand images (Marion and Crowder 2013, 50).

Generally archaeological interpretive visualisations are consumed in one of two spheres, public or academic, and each comes with its own set of preconceived expectations. Within the public sphere particularly there are a number of complex arguments regarding the notion of display and the sustainability of visual representation in archaeology. For example, images of the past are often presented in a lingering context (interpretation boards on a site, within museum displays and in books) which will usually last longer than the theories they were originally designed to support (Smiles and Moser 2005, 5-6). As such they become engrained in the minds-eye, in a sense shaping and 'fixing' knowledge (Swogger 2000, Thomas 2009). In recent years the advent of photorealistic or hyperreal digital rendering techniques for the visualisation of heritage sites has intensified this debate over audience perception. Many have argued that realistic rendering techniques present nothing more than a flexible form of reconstruction drawing (Barceló 2000, 28 and Gillings 2005, 223), while others raise concerns that photorealism falsely increases the authority of a particular visualisation (Frankland 2012, 25). The debate has been rehearsed in the literature numerous times (Miller and Richards 1994, Ryan 1996, Eiteljorg 2000, Earl 2006 and Frankland 2012), the result being that photorealistic styles are generally seen to compound already prominent issues relating to interpretation which address the emotive and ephemeral aspects of life in the past (Frankland 2012, 25). Frankland's (2012) experiments in presentation and style have demonstrated that audiences will often perceive the same information differently dependent on the style or medium of presentation (for example when presented with line drawing, watercolour and photorealistic rendering). Though Frankland's (2012) study presents a compelling argument these issues of perception and media have the potential to be further developed and explored through the positive exploitation of audience perception.

### 3.2.1 Visualisation and Archaeological Research Practice

As this research will go on to demonstrate, virtual representations have the potential to facilitate new modes of engagement and interpretation if the methodologies for their creation foreground the importance of process. In archaeology visualisation can act as a catalyst to interpretation, facilitating a discourse between practitioner, site and archaeological record (Watterson 2012, 21); essentially initiating a process of thinking through doing. Rust (2007, 70) observes that artists often create in order to understand what they wanted to create and certainly, the creation of digital 3D models can act as dynamic tools for archaeologists to think with if integrated into the working process itself (Riedel and Bauer 2008, 141).

In recent years there have been a few notable attempts to integrate visual artists early in the fieldwork and interpretive process. The *Stonehenge Landscape Project* for example paired phenomenological approaches in the real world with virtual exploration in a digital landscape and saw the academic process develop through the utilisation of these virtual environments (Exon *et al* 2000, 8). A more recent project was conducted around the Kilmartin Glen prehistoric rock art in Argyll, Scotland by Jones *et al* (2011). This project and consequent publication included visual artists as active contributors throughout the course of the fieldwork and the publication reflects this as creative work augments the visual presentation of the archaeological data, for example when providing another way of visualising the same material. As pictured in Figure 3.2, GIS viewsheds, plans and excavation details are printed alongside atmospheric photographs which capture different weather and times of day, sketches of fieldworkers excavating, colourful imaginings and collage. This diverse mix of media and approach comes together to strengthen debates within the text, layering different ways of seeing the site, the excavation process and interpretation together. The sketches of fieldworkers juxtaposed with abstracted informative plans in particular serve to claim back a sense of materiality with the data which is often lost between fieldwork and publication.

So why have creative visual methodologies not played a more prominent role in archaeological interpretation? Gillings (2005, 224) speculates that the lack of theoretical discussion and absence of any sustained body of critical theory in this area may be attributed to the specialist knowledge required to produce visualisations, especially in a digital medium where a certain level of technical ability is required. What is more, he observes that where critical discussion has taken place it has tended to occur *after* these images have been produced, resulting in a system of post-hoc justification rather than the development of a sustained guiding methodology. Moser (1998, 1-2) has previously noted that reconstruction-type images in archaeology have been taken for granted for a long time, seen as being self-explanatory and unproblematic rather than as complex documents drawing upon a range of pictorial devices in order to generate meaning.





**Figure 3.2:** A select collage of some of the imagery presented within the Kilmartin Glen report (Jones *et al* 2011).



However, in contrast to those writing from a virtual reality perspective where digital images have often been taken to be more truthful (Gillings 2005 and Earl 2006) she believes these images have largely been perceived as being divorced from the serious practice of science. As a result of the many meanings images can evoke, academic disciplines and texts often marginalise the role of the image in research as being too difficult to control, essentially destabilising the scientific premise of objectivity and replication (Marion and Crowder 2013, 45). It is often with this objective mind-set that archaeologists aim to achieve a situation in which an image simply records rather than imagines its subject, the intention being that a research orientated image would be less open to critical visual analysis (Smiles and Moser 2005, 2).

Smiles and Moser (2005, 2) believe that an image can never be created and comprehended with complete transparency, noting that even excavation reports are coded, bearing traces of wider beliefs about evidence, knowledge, and the communication of both. As a consequence of this desire for objectivity people tend to be reduced to data in the eyes of archaeologists (Zimmerman 2008, 184). This is particularly prevalent in the field of virtual reality, where the majority of three dimensional representations of sites tend to strip out every trace of humanity, presenting models as “sterile shells” which serve to visualise a space rather than defining a place and time (Earl 2005, 214-215).

Certainly, a compelling visualisation can make itself ‘easy to love and difficult to doubt’ (Turkle 2009, 7), especially when that visualisation deals with complex human agency, stirring an emotive response from the viewer which, as Berger (1972, 6-7) observes, results in their empathy for the subject or situation, thus rendering visualisation seductive. Empathy and emotion are not commonplace in archaeological scientific discourse and their presence is often perceived as being subjective, problematic and unquantifiable. Many archaeologists (Richards 2005 for example) remain concerned by the subjectivity of their interpretive processes in the field. However, the continuing rise of post-processualism has furthered the discussion in a positive direction (Elphinstone and Wickham Jones 2012, 536), supporting self-reflexive phenomenological approaches and the creation of narratives as an academically viable means of experiencing and understanding sites and landscapes (Joyce 2002). Wheatley (2000, 126) believes that the avoidance of aesthetic and personal experience in visualisation is irrational and misguided. As this research will demonstrate, dehumanizing our representations of the past is not a productive solution. Rather than being avoided as the researcher’s unquantifiable enemy, subjectivity in visual work and field methods should be engaged with as a core dimension of our interpretive process and representation (Pink 2007, 23).

### **3.2.2 Visualisation Best Practice**

With the aim of addressing the complex issues associated with the curation and quantification of the more subjective processes associated with visualisation of the archaeological record much of the recent

literature has centred on the encouragement of self-reflexive analysis of what is being represented and how, resulting in a multitude of papers and publications advocating guidelines and transparent methodologies of working (Eteljorg 2000, Ryan, 2001, Earl and Wheatley 2002, Pletinckx 2007, 2009, Denard 2009, Baker 2012). Also significant are the 'Guides to Good Practice' titles for CAD (2002) and Virtual Reality (2002) published by the Archaeological Data Service (ADS) on their website<sup>3</sup> and the Virtual Archaeology Special Interest Group (VASIG) and the Cultural Virtual Reality Organisation (CVRO) initiatives. These guides and initiatives stress the importance of ensuring firstly that computer-based visualisation methods are applied with scholarly rigour, and secondly that the outcomes of computer-based visualisation research should accurately convey to users the status of the knowledge and uncertainty they represent (Denard 2012b, 73). These guides tend to have a very technical focus with a view to archiving data, rather than any broader interpretive perspective.

Overall although proposing such technical frameworks for the generation of metadata may be adequate for the more straightforward modes of visualisation in archaeology (GIS diagrams, architectural style drawings and artefact illustration) it is inadequate for much of the interpretive visualisation and artistic renderings discussed in this thesis as it serves to generalise, objectify and distance, shying away from the creative qualities and potential these types of expressive visuals offer to archaeology. The London Charter<sup>4</sup> initiative aims to provide a methodological framework for the creation of computer-based visualisation for researching and communicating cultural heritage (Denard 2012, 57). The Charter advocates that in order for visualisations to be part of meaningful disciplinary dialogue the processes involved in their creation must match the rigour of conventional research and as such be accessible (Denard 2012, 73). Following a multitude of papers written from the mid-1990s onwards (Ryan 1996, Roberts and Ryan 1997, Niccolucci 1999, Goodrick and Gillings 2000, Frischer *et al* 2002, Jablonka *et al* 2003, Roussou and Drettakis 2003, Zuk *et al* 2003, Hermon and Niccolucci 2006), the Charter originated as a means of documenting the nature, scope and validity behind the production of hyperreal digital visualisations, essentially promoting a framework of intellectual transparency supported by *paradata* (Denard 2012, 57).

While *metadata* describes observational technicalities such as equipment settings, data ownership, hardware and software, *paradata* documents the intellectual process involved in such practices. Paradata captures the selection, evaluation and exploration of ideas, as well as entropy and cultural assumptions, research and technical decisions, inference and implied possibilities and probabilities of different data and information. As such these paradata records become an extension of the data load, sitting alongside metadata records and make it possible to track the reasoning and construction of a

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<sup>3</sup> ADS website [www.guides.archaeologydataservice.ac.uk](http://www.guides.archaeologydataservice.ac.uk)

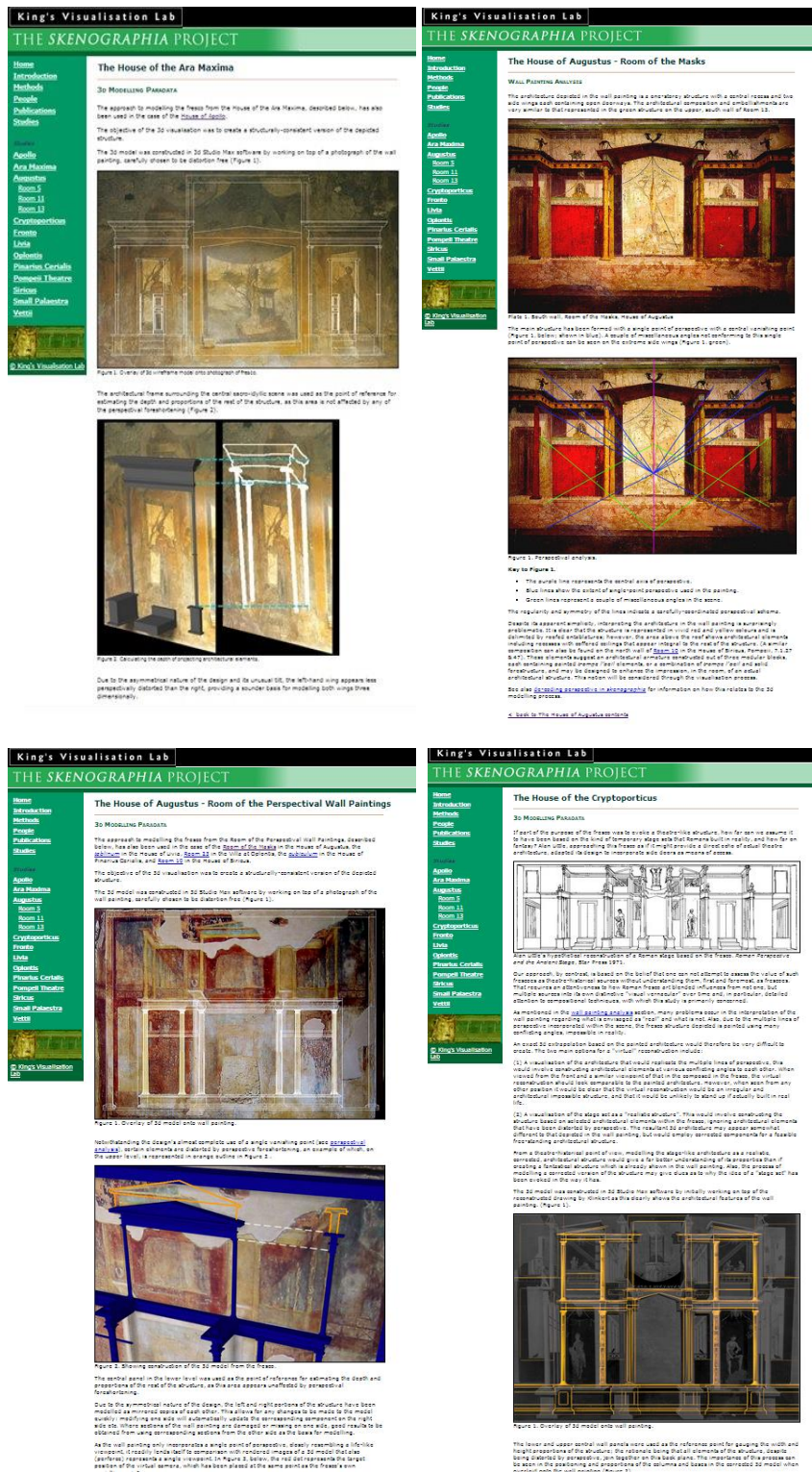
<sup>4</sup> London Charter website [www.londoncharter.org](http://www.londoncharter.org)

given visual hypothesis as it is presented in an interpretive visualisation. In the field of heritage visualisation, the metadata of a 3D model or visualisation is ideally kept as objective as possible, while the subjective process of combining data to transform the base data into something more meaningful is held in the paradata documentation (Baker 2012, 172-173). Baker (2012, 173) explains that in this way an interpretive visualisation becomes a vital component of the research narrative as it gives others the ability to see how an argument has been constructed and allows inevitable uncertainties to remain visible and intact.

Most of the examples of paradata being implemented as part of a practical three dimensional modelling methodology come from the King's Visualisation Lab at King's College in London, and have been headed by a number of contributors to the London Charter including Denard and Baker. For example, the *Skenographia* Project (pictured in Figure 3.3) investigated Roman wall paintings through digital visualisation and is publically available through an online archive. This archive contains detailed paradata in the form of written documentation of the technical modelling and interpretive decisions made during the visualisation process. A subsequent project *Visualising the Odeon of Agrippa* was developed by the same university department to further the integration of paradata into the visualisation process thus allowing researchers a means of communicating the distinctions between fact, plausible conjecture, intelligent guesses, and alternative hypotheses. Once again with this project the resulting three dimensional visualisations were accompanied by an archive of paradata documentation which encompassed both architectural and archaeological research outcomes in order to promote intellectual transparency as proof of scholarship. Though these examples are both successful in integrating an awareness of the need to document and present paradata as part of the archaeological visualisation process this archival approach is somewhat awkward as it does not facilitate simultaneous understanding as part of the final visual output. Discussion of capturing and documenting paradata as part of the visualisation process raises an important theme upon which this research is hinged, namely that with interpretive visualisation in archaeology the final image only scratches the surface of a complex interpretive process. As Baker observes in the context of archaeological visualisation practice, "the journey is often more important than the destination" (Baker 2012, 174).

### **3.3 Summary**

Outside the demonstration of novel techniques and technologies the body of literature concerned with archaeological computer science wrestles with issues of validity and intellectual integrity, the perceived seductive power of images, the representation of uncertainty, documentation, sustainability and access (For example Gillings 2005, Earl 2005 and 2006 and various proceedings and papers including Barceló *et al* 2000a and b, Greengrass and Hughes 2008, Posluschny 2008 and Chrysanthi *et al* 2012 among others).



**Figure 3.3:** A selection of screen-grabs of webpages from the *Skenographia* project (<http://www.skenographia.cch.kcl.ac.uk/>).

The solution offered by the field of archaeological visualisation at present largely comes down to methodologies of best practice which advocate intellectual and technological scholarly rigour as employed by the wider field of archaeology and heritage with the aim of promoting transparency of process and giving validity to the outcomes of computer-based visualisation practices (London Charter 2009).

In Chapter 2 the strength of visualisation was discussed in terms of its ability to express simultaneous expression of information and ideas. Although visualisation can surpass verbal or textual explanation, as this chapter has demonstrated, it is still lacking in explanatory value as, to the viewer, an image alone does not reveal an account of the processes and decisions involved in its creation (Denard 2012, 60). Thus in order for a viewer to wholly appreciate a visualisation, the audience must have an understanding of the research process itself in order to assess it as part of the interpretation. However, despite the efforts of practitioners who advocate transparency and documentation of the visualisation process by means of metadata and paradata (Ryan 2001, Pletinckx 2007, Hermon and Nickodem 2008, Denard 2009) it remains difficult to ascertain the 'success' of a particular visualisation as its subjective nature makes it resistant to the conventional evaluation techniques prevalent in science (Earl 2005, 212). The newly integrated paradata aspect of the London Charter (version 2.1) advocated by Bentkowska-Kafel, Denard and Baker (2012) marks a productive step forward though compelling examples of its implementation outwith the University department the concept has been developed by are few. In archaeology at present there are no methodologies for the creation of visualisation work which encourage and embrace the creative process. As archaeologists we need to move forward as a discipline and establish a more productive approach to making and consuming these images and consider the ways in which they can influence and aid in the creation of new knowledge.

## 4 Methodology

As established through the previous chapters the primary concern of this research is the process by which archaeological visualisations are formulated, from the interrogation of the archaeological record through to the production of images and animations. Through a series of case-studies the research will provide in-depth and critical narratives of the reconstruction process throughout each stage of data collection in the field, creation of digital 3D models and consumption of the resulting visualizations by various audiences with the aim of understanding how this process of visualisation and the creation of subjective narratives influences the integrity of the captured record, the control of experience and the ways of dealing with ambiguity in the archaeological record.

This chapter outlines the methods and overall research design of this thesis. The key research problems discussed in the previous chapters will be summarised before moving on to a discussion of the theoretical framework within which this research has been conducted and a detailed account of the techniques, software and methods used at each stage of the workflow.

### 4.1 The Research Problem

This research addresses a series of problems with the production and consumption of visualisation in the field of archaeology at present which directly affects different stages in the visualisation workflow. In providing an overview of the history of visualisation in archaeology Chapter 3 observed that theoretical adaptation following the uptake of digital technologies for recording and visualising the archaeological record was slow to develop alongside the rapidly advancing technology (Pujol-Tost 2008, 102-103). Rather than the theory developing alongside the technology, use of these digital and virtual techniques merely served to reinforce the more traditional culture-historical concepts of passively observational archaeological practice, remaining largely descriptive rather than analytical. As the pilot case study will demonstrate, placing too much emphasis on the perceived objectivity of digital techniques alone has resulted in an interpretive detachment from the archaeology as the practitioner's engagement with the subject of their study is constrained by systematic and automated machines. This is a difficult issue to resolve as many have suggested that digital technologies and post-processual theory (which concerns the engaging subjects of the formation of interpretive narratives, experience and expression) are opposing approaches (Whitley 1998, Zubrow 2006, Jones *et al* 2011). Though a multitude of techniques and media are available for visualising the archaeological record which vary in their objectivity and subjectivity there is little collaboration between specialists and consequently most interpretive visual methods are used in isolation from one another.

This impression of incompatibility stems from many of the methods of post-processual interpretation and creative visual media being harder to quantify in the same way as measured, systematic and automated digital approaches. In archaeology at present there are no defined methodologies for the creation of visual work which actively encourage and embrace this creative process or are capable of capturing or reproducing ephemeral sensory qualities such as sound, or the impact of time and movement upon how a place is understood. These aspects are fundamental giving depth to interpretive visualisations. The newly integrated paradata aspect of the London Charter (version 2.1) advocated by Bentkowska-Kafel, Denard and Baker (2012) marks a productive step forward though as discussed in Chapter 3 compelling examples of its implementation outwith King's College are few and although paradata can be compiled as part of the creation process it remains difficult to simultaneously disseminate the collected information for a general audience. Until issues of quantification and transparency raised by initiatives such as the London Charter are successfully addressed and integrated into practice visualisation will continue to struggle in affording itself a more prominent role as part of the research process as an academically viable interpretive method.

Many of these problems remain unresolved and the subject of repeated debate within the literature. This research will demonstrate that in order to address these issues effectively it is necessary to consider multiple stages of the visualisation process in detail. Too much emphasis has been placed on the resulting final visual outcomes when what is needed is an in depth understanding of the *process* behind the creation of these visualisations which are the result of a series of complex technical and interpretive processes.

In light of these research problems, as outlined in Chapter 1, this thesis will assess the practices and practical application of visualisation in the field of archaeology in order to further understand and develop its role when framed within academic research practice. Through the observation, exploration and collaboration of various techniques and approaches to visualising the archaeological record this thesis aims to challenge the common preconceptions and assumptions associated with 'reconstruction', redefining its role within the field by investigating the following research questions:

- In what way is a practitioner's interpretive engagement with an archaeological site mediated by different data capture and visualisation methods in the field?
- How might practitioners of archaeological visualisation combine the creative and subjective methods of storytelling and visual expression with the more systematic and traditional means of data collection and visualisation to create dynamic and challenging imagery which promote cognition?

- How can we foreground and communicate the importance of the interpretive process involved in the creation of engaging visualisations to general audiences?

This research investigates a partnership between established digital survey methods and more creative and involved ways of interpreting and consequently visualising archaeological sites. The case studies will demonstrate that the strength of integrating artistic and embodied methods in archaeology is not necessarily in an ability to break down or reinvent established processes. Instead, their strength lies in their willingness to negotiate a complementary partnership between the subjective and the objective perspectives of the site.

## **4.2 Theoretical Context**

Archaeology is a complex field constructed from a combination of different schools of interpretive thought and practice. These communities of interpretation define the frameworks within which archaeologists describe, interrogate and present their data and have evolved throughout the history of archaeological study. In the context of visualisation practitioners must be conscious of where modes of representation are situated across this spectrum as this influences the ways our interpretive narratives about the past are constructed.

Since its origins in antiquarianism archaeological theory has gradually become more self-aware and reflexive of its own approaches and their consequences for interpretation. For example, one of the earliest manifestations of archaeological theory, culture-history, focussed on the predominantly descriptive study of past societies defined by typologies of craftsmanship where change was determined by diffusion, migration or invasion. Processual archaeology was developed in the 1960s and favoured scientific method and hypothesis-testing. Though this approach harbours its own issues, at the time it served to encourage the discipline to engage with the study of individuals in the past rather than homogenous cultures and ethnic groups. Processualism (and to an extent the field of systems theory) introduced a concept still favoured by many in archaeology today, namely that rigorous scientific method could reveal the lives of ancient societies with greater accuracy, presenting an authoritative account of the past. Ideologies from both culture-history and processualism still retain a grip on the field of archaeological visualisation, particularly within digital mediums of survey where scientific accuracy in recording observational surface data remains paramount to the success of the material being regarded as objective.

Chapter 3 noted that the research design and analysis within this thesis follows what can be considered a largely post-processual methodology. Post-processualism was born out of a frustration with the objective and scientific claims of processualism and concerns themes of agency, materiality, lived experience,



phenomenology and representation (for example, Hodder 2012, Jones and MacGregor 2002, Gosden 1994, Thomas 1996, Tilley 1994, 1996). From its inception in the early 1990s it encouraged archaeologists to recognise that on some level everyone is biased by their own previous experiences and background, making scientifically objective interpretation of the intangibilities of the past impossible. This self-reflexivity, imposed through engagement with the subjective and often creative processes involved in post-processual interpretation, is important in the context of archaeological image-making in particular; it can have a direct impact on the fieldwork methodology, the form representations take and the resulting context in which these visualisations are encountered by various audiences.

Although this research identifies most closely with ideas of post-processualism, it is important to recognise that many of the techniques used (particularly methods of digital data capture) have been adopted into the field within largely observational, descriptive and processual contexts and that this has had a notable effect upon how this material is often perceived across both academic and public contexts. This research operates on the premise that archaeology is constructed through the processes of picturing the past in the present and thus all interpretations, although informed by evidence, are influenced to some degree by present-day context.

In Chapter 3 the conflict between post-processualism and digital technologies was addressed based on the grounds for their perceived incompatibility (see Whitley 1998 and Zubrow 2006). According to a number of sources (Zubrow 2006 and Jones *et al* 2011 for example) it appears that this statement comes from a belief that subjective and objective approaches cannot by their nature coexist within a single approach. This thesis will move to challenge this preconception by experimentally utilising, analysing and layering a selection of mixed approaches in order to investigate this problematic notion. Issues of validity and intellectual integrity are the current focus of much of the current literature in the field of archaeological computer science. As discussed in Chapter 3, the present solution offered by the field of archaeological visualisation concerns methodologies of best practice which advocate intellectual and technological scholarly rigour as employed by the wider field of archaeology and heritage with the aim of promoting transparency of process and giving validity to the outcomes of computer-based visualisation practices (London Charter 2009). The most prominent of these best practice initiatives is presently the London Charter which was introduced in Chapter 3, though other examples such as the AHDS Guides to Good Practice for CAD (2002) and Virtual Reality (2002) do exist, in addition to enterprises such as the Virtual Archaeology Special Interest Group (VASIG) and Cultural Virtual Reality Organisation (CVRO).

As the case studies progress this research makes use of particularly artistic and creative approaches to representing the archaeological record often drawing upon methods in phenomenology and lived experience to enhance the story of a place and to bring the evidence to life, thus adopting a best practice

methodology which facilitates this academically was paramount to the success and validation of the work. Pink (2007, 23) warns that adopting a reflexive approach does not provide a means of eradicating or neutralising subjectivity in order to produce objective results. Crucially however, she argues that it is short-sighted to advocate the avoidance of subjectivity in visual work and believes that subjectivity should be actively engaged with as a core dimension of the interpretive process and representation. With this in mind a reflexive methodology which consisted of frequent evaluation and discussion was adopted for each case study project in order to maintain an analytical self-awareness of the visualisation process, but fundamentally to centralise the subjective nature of the work. For all work by both the author and the collaborators a reflexive site notebook was kept throughout the course of the fieldwork and post-processing stage.

### **4.3 Research Design**

The following section outlines the overall research design developed and adopted in order to conduct the case studies. Firstly, the techniques for collecting and manipulating data are described and justified before giving an overview of the scope of the study in terms of why the case study sites were chosen. Then the structure of the case studies is outlined by means of a workflow describing the stages of *collection* of data and information in the field, *creation* of digital models, animations and narratives, and *consumption* of the resulting visualisations by general audiences.

#### **4.3.1 Instrumentation**

Marion and Crowder (2013, 47) summarise the adoption of digital technologies in the research process by noting that technology facilitates two things: it allows us to do what we already do better, and it creates an opportunity for new approaches and outcomes. The use of digital media in archaeological visualisation is logical in the field at present, as data capture on site has become almost entirely digitized it makes sense to continue to process and visualise the source material in a complementary medium. For example, it would be counter-productive to survey a site using laser scanners, and then produce a visualisation of the site using oil paints. Though a range of approaches were considered and in some cases directly observed alongside the author's own methods, for the timeframe of this research it was necessary to limit the focus to digital media of data collection and representation, specifically laser survey, photogrammetry, 3D modelling and animation. In the context of this research, all visual material produced by the author was either born digital or has been digitised for incorporation into the final outcome. It should be acknowledged also that while it is equally as feasible to produce visualisations based on spatial data and measurements from manual field survey techniques (site plans and elevation drawings for example), given the complex and organic nature of the upstanding structures at the case

study sites laser scanning and photogrammetry proved to be useful in providing a reliable impression of the site which would act as a basis for visualisation and further digital reconstruction.

#### **4.3.2 Scope of the Study**

Data acquisition from laser survey is a rapidly expanding field in the heritage industry and the core dataset for this research was obtained from the Scottish Ten project surveys of St Kilda in the Western Isles and Skara Brae in Orkney. These sites represented constants in so much as they were all surveyed by the Scottish Ten team using the same methodologies and techniques, and archaeologically they are all settlement sites.

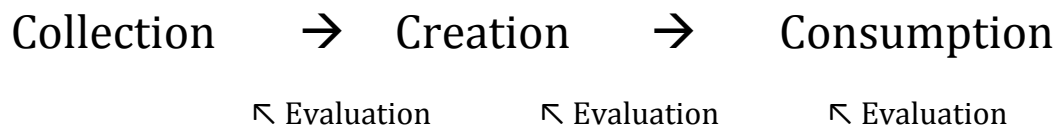
Prehistoric sites in particular present tremendously insightful case studies in archaeological visualisation because the nature of their interpretation serves to compound many of the issues present in the field of visualisation for heritage. Compared to St Kilda, whose archaeology remains in living memory, the reconstruction of prehistoric sites such as Skara Brae are very much up for debate and numerous theories and schools of thought exist relating to multiple aspects of prehistoric life at these sites. Notable interpretations of the evidence from prehistoric sites across Europe and beyond suggest that these communities are likely to have shared a vastly different understanding of their world than we do today (Bradley 1997 and Watson 2004, 94). As such, interpretation of lived experience at these sites (as is one of the fundamental functions of the interpretive archaeological visualisation approach used within this research) is further complicated and provides a challenging context for visualisation.

The initial pilot case study was conducted in order to evaluate the data acquisition and processing methods in detail to establish the strengths and weaknesses of this particular technological approach. Over the course of two weeks between June/July 2011 the author was able to evaluate the use of a range of terrestrial and hand held laser and structured light scanners working as part of the Scottish Ten team to survey areas of settlement on the main island of Hirte, St Kilda. Visualisation work on the St Kildan blackhouse was conducted by the author alone and worked along a traditional framework for modelling and reconstructing elements of the structure following on from the survey dataset. This pilot case study acted as a control project which could be used as a comparison against subsequent collaborative work at Skara Brae. The research methodology was reevaluated in light of the conclusions reached following the pilot study on St Kilda and a refined approach which widened the study group to facilitate the involvement of additional artists and archaeological practitioners was implemented. Having established that understanding the creation process in detail would be paramount to the success of this research it was felt that analysis of the authors' process alone would provide too narrow a representation of what is a very dynamic and varied field of investigation. To this end a collaborative project was initiated between

the author, artist and archaeologist Dr Aaron Watson and kite aerial photographer and animator Kieran Baxter to produce a collaborative visualisation of Skara Brae.

### 4.3.3 Defining a Workflow

Earlier the concept of visualisation workflows was introduced alongside the practice of keeping paradata during the development of a project in order allow practitioners of visualisation to curate a coherent picture of the various steps taken when generating and processing their data towards a visual outcome. Within this research workflows have been utilised in a number of ways: as a means of structuring the research design, as a mode of documentation and as a means of analysis and comparison between case studies.



**Figure 4.1:** The collection, creation, consumption workflow, which features frequent reflexive evaluation.

For most archaeological visualisation work three major stages are always present (see Figure 4.1) which, following the specification of a project brief, consist of the collection of data in the field, the creation of interpretive images (in this case three dimensional models and animations) and the consumption of the outcomes by an audience following dissemination of the visualisation(s). As mentioned earlier, these stages have been used to give structure to the research problem by identifying issues to be resolved along the visualisation process. This section will provide a comprehensive introduction and description of each of these integral stages, explaining and justifying the technologies and methods used and providing some discussion of the reasoning behind the research design at each stage.

The techniques and methods utilised by this research have somewhat conflicting methodologies in practice. Systematic conventional survey techniques such as laser survey and photography (used here to collect data in the field) operate along a linear pipeline, while in contrast more creative approaches to site interpretation and visualisation do not always conform to an established workflow and practitioners can be frequently considering a multitude of stages across the conventional ‘pipeline’ method of working, all at once. Much like Heidegger’s hermeneutic cycle, the process of interpreting a site in order to visualise it as a whole is established by referring between individual parts of this ‘pipeline’. As such, research and fieldwork which integrates more embodied and creative approaches to the interpretation of archaeological sites will be subject to multiple variables which will result in the cognitive process being different every time. In academic research embracing a subjective method is often viewed in a negative light as being unpredictable and unquantifiable. As discussed earlier, the present London Charter

(version 2.1) advocates that the outcomes of research which include computer-based visualisation should accurately convey to users the status of the knowledge that they represent, such as distinctions between evidence and hypothesis, and between different levels of probability by means of the documentation and presentation of paradata alongside standard metadata records (London Charter 2009). Within this research paradata has been documented throughout the case studies by means of written notes and sketches in a reconstruction diary as well as online by means of the author's research blog<sup>5</sup> (Watterson 2014). These documentary formats were adopted in order to proactively deal with some of the subjectivity involved in the interpretive process in a sustainable way. Within this research paradata is used to:

- Keep track of creative decisions and their sources.
- Document the ways in which particular evidence has been interpreted.
- As a tool to reflect on the experience and phenomenological approach to interpretation of a site.

However, these field notes have not been digitised and stored in a structured dataset as suggested by the London Charter. Instead, the content has been incorporated into descriptions and discussions of the case studies in Chapter 5 to provide a more articulate representation of the process.

Further reflexive observation of the work was compiled by means of professional and general public feedback during two significant stages of the project. First by means of a focus group at the Orkney College (University of the Highlands and Islands (UHI)) in Kirkwall prior to the fieldwork and secondly, feedback questionnaires were collected from venues who exhibited the final film.

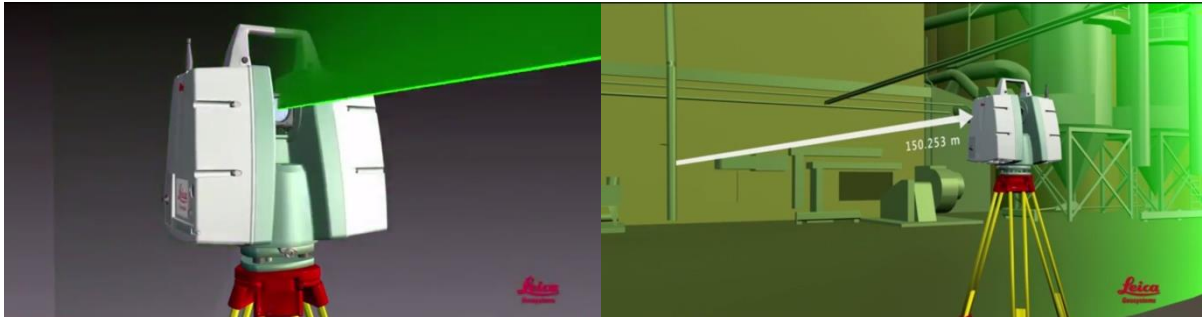
#### **4.3.3.1 Collection**

Within this framework "collection" generally refers to the fieldwork stage of each case study whereby raw data is gathered either by means of a survey, various digital capture techniques or by a field visit and exploration of the site. Following the pilot case study on St Kilda which closely observed the collection of raw data in the field the initial methodology was re-assessed and some adjustments were made to the research design. This section describes the data capture techniques initially used at each of the case study sites before outlining the evaluations made following completion of the pilot case study. Subsequently an adapted fieldwork stage was developed as an experimental solution to address some of the issues and concerns raised following the St Kilda pilot study.

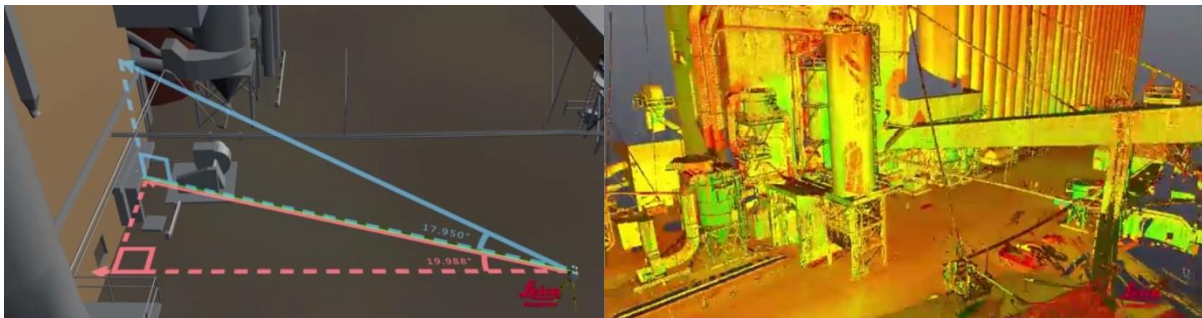
The primary survey data for both St Kilda and Skara Brae was collected in the field by Historic Scotland's Scottish Ten team using a range of terrestrial 3D laser scanners and hand held structured-light scanners.

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<sup>5</sup> <http://digitaldirtvirtualpasts.wordpress.com/>



*The scanner slowly rotates on its vertical axis and emits a pulsing beam which rapidly moves up and down.*



*Data is collected when the laser beam hits a solid surface which in turn bounces an energy signal back to the scanner. The machine collects multiple points within the survey area which each have XYZ coordinates determining their position in three dimensional space which creates a 3D point cloud of data.*



*A number of laser scanners also have the on-board ability to collect RGB colour data alongside spatial point cloud information.*

*In order to create a comprehensive survey of a site it is necessary to move the scanner to different vantage points in order to facilitate maximum surface coverage. These scans can then be aligned, either automatically by the scanner, or by a manual process completed by the practitioner using specialist software post-fieldwork through a process called “registration”.*

**Figure 4.2:** A visual breakdown of the laser scanning process (Leica information video <http://www.youtube.com/watch?v=1lDO1UevAJI>).

These different scanners all operate on the same basic principles. For example, the terrestrial laser survey machines (such as the Leica ScanStation C10 (as illustrated in Figure 4.2) and Leica HDS6100 phase scanner) operate by automatically rotating around their vertical axis while emitting a pulsing or continuous laser beam which is rapidly moved up and down by an internal mirror. This allows the machine to systematically sweep the area within a designated range from a fixed point. Data is collected when the laser beam hits a solid surface which in turn bounces an energy signal back to the scanner. If the signal is strong enough it is detected by an on board sensor and timer system which calculates the distance from the scanner to the surface. The machine collects multiple points within the survey area which each have XYZ coordinates determining their position in three dimensional space thus creating a three dimensional point cloud of data. In order to create a comprehensive survey of a site it is necessary to move the scanner to different vantage points in order to facilitate maximum surface coverage. These scans can then be aligned, either automatically by the scanner in the field using a technique called “traversing” which uses a series of targets to allow the scanner to position the scans accurately, or by a manual process completed by the practitioner using specialist software (for example Cyclone, Polyworks or Meshlab) post-fieldwork through a process called “registration”. These point clouds can also be geo-referenced to local coordinate systems which allow integration of further geographical information from other sources.

Though it is possible for the laser scanners to collect RGB colour data alongside the spatial point cloud information, the Scottish Ten project methodology did not make use of this on board feature but instead employed a system of “Nodal Ninja” camera rigs to collect photogrammetry data from the same fixed position as the laser survey. Nodal Ninja rigs are a type of panoramic tripod head which allows the fixed camera to rotate 360° and take multiple wide-angle digital photographs which can later be aligned to create a seamless panoramic image. In the context of the Scottish Ten survey this technique was used to create photographic texture information which could later be draped over the laser scan spatial data.

As explained earlier, the pilot case study closely observed the Scottish Ten survey of St Kilda by means of active participation as part of the survey team. Reflexive observations concluded that although this initial data collection phase of the visualisation workflow was successful in providing unparalleled three dimensional spatial coverage of the site it lacked fundamental practitioner engagement with the subject of the survey. An archaeologist working in the field would normally begin their interpretive process as sensory engagement with the site, primarily through vision, though other senses such as touch also come in to play for example when identifying material. Most types of traditional archaeological survey and recording require some level of deeper cognitive interaction with the site. For example, a plane table survey, standing building survey or on a smaller scale artefact drawing require the practitioner to

interpret and understand what they observe before they take a measurement and translate it onto paper.

Recent advancement and uptake of automated techniques (such as laser survey) for recording sites and landscapes has removed most of this opportunity for archaeologists to engage with the subject of their survey and their primary material in any sort of meaningful way and as a consequence these tactile experiences are often muted by the use of technology. At such a fundamentally critical stage in the visualisation workflow such detachment from the site can prove to be problematic as was the case with the St Kilda pilot study (outlined in Chapter 5) where mistakes were made in the initial blackhouse reconstruction phase because structural intricacies were overlooked in the field. The case study itself is described in far greater detail in the next chapter, but these observations saw a re-evaluation of the techniques being used as part of the visualisation workflow and a modification to the fieldwork stage for subsequent case studies.

In light of these findings following the pilot study some adaptations were made to the field methodology for the Skara Brae case study. Within this research laser survey is believed to be an efficient and useful means of collecting comprehensive spatial and aesthetic detail on the site. However, as a single means of visualisation it was found to be restrictive as use of systematic survey machines was observed to negatively mediate practitioner interaction with the site and forgo any meaningful interpretive or embodied engagement. Thus different methods and approaches to the visualisation of the site were sought in order to expand on the perspective offered by scanning alone. It was realised that a single practitioner's insights and methods alone may not be enough to adequately assess this and as such additional practitioners with a range of different skills were invited to participate in the collaborative visualisation of Skara Brae. As such, Kieran Baxter of the Duncan of Jordanstone College of Art and Design (DJCAD) at the University of Dundee (who was a MSc student at the time of the fieldwork but has since begun a PhD) and Dr Aaron Watson of Monumental accompanied the author on the fieldwork to Orkney in May 2012 and the team worked collaboratively to produce a short interpretive mixed-media film about Skara Brae.

Photogrammetry was conducted independently from the Scottish Ten project during the subsequent stage of fieldwork at Skara Brae using two different techniques. The first was structure from motion photogrammetry which was conducted by Kieran Baxter using kite aerial photography whereby a camera rig set to capture digital photographs at a rate of every 3 seconds was flown in a traverse across the site. The second method was employed to capture the surfaces of artefacts and some select examples of carved stone from the site. Multiple photographs were taken moving systematically across the surface under controlled conditions to maintain even lighting. The resulting images were stitched together using



Autodesk 123D Catch software which produced a solid photo-textured mesh of the site, carving or artefact using automated algorithms.

These alternate survey methods provided a mixture of different perspectives alongside the laser scan dataset for the site. The low angle aerial view from the kite photographs served to situate the site within its immediate landscape setting, while photogrammetry of smaller artefacts and carved stone focussed down on some of the smallest and most delicate aspects of the site. Although these methods provided some additional complementary perspectives from which to visualise the site, engagement with the archaeology itself was still being mediated by the use of technology and there was little room for an interpretive process to develop within the practice. Consequently, manual sketching, photography, high definition digital video footage and sound bites were also captured. What is more, during the fieldwork time was taken to explore the structures and to visit contemporary prehistoric sites nearby to begin to develop an impression of the wider landscape, all the while documenting any interpretive thoughts and referring back to the relevant interpretive literature and excavation reports. Although some of these additional techniques involved digital technologies, these methods were adopted to directly facilitate and document embodied engagement with the site. In the case of the digital video footage, much of the early material collected was not pre-determined but recorded the practitioner's free exploration of the site.

As the case studies will demonstrate, interpretation of the archaeological record is a multifaceted process, further complicated when translated into a creative visual medium. Much of the literature discussing the production and use of archaeological visualisations dedicate the bulk of the discussion to evaluating the finished visual outcome and give little focussed consideration to the stage whereby data and information is gathered (for example Molyneaux 1997, Gillings 2005, Smiles and Moser 2005, Earl 2006, Pujol-Tost 2008, Frankland 2012). From its earliest inception this research aimed to evaluate and observe visualisation at all stages of the process and as such the fieldwork stage was considered in detail in order to comprehensively assess the significance of time spent in the field on the practitioner's engagement with the site, the kinds of material which are observed and collected and the ways in which this stage influences the subsequent stages of the creation of interpretive visual outputs and the overall narrative of the site in question.

#### **4.3.3.2 Creation**

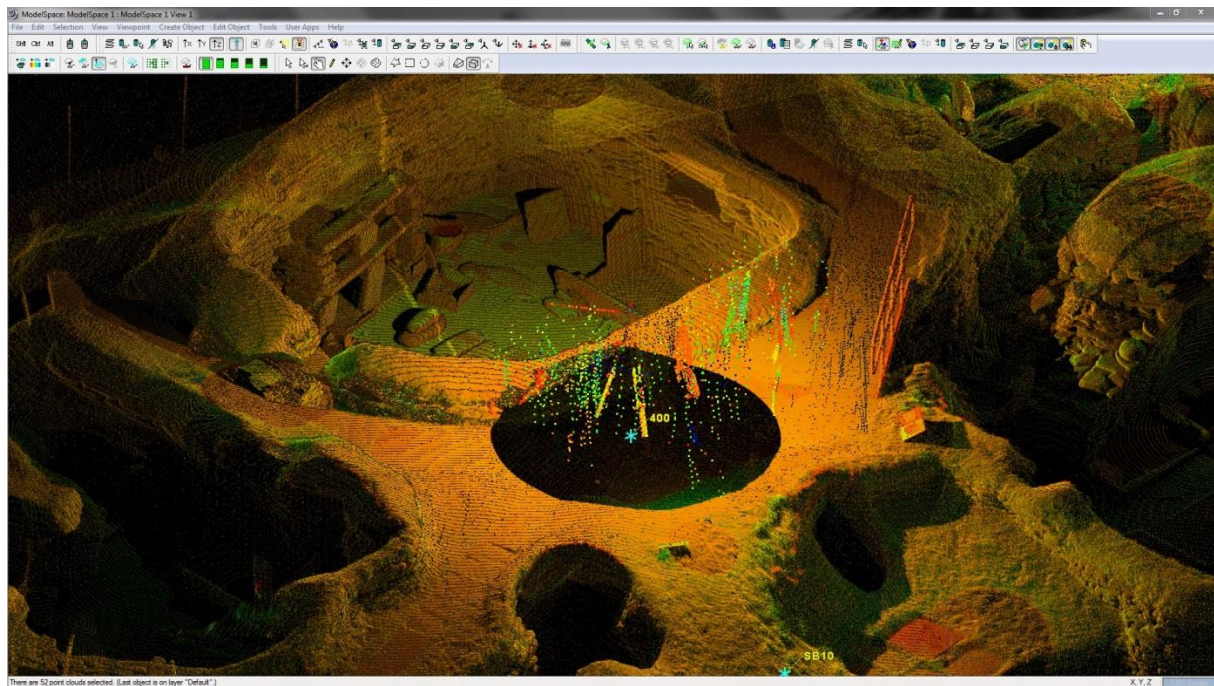
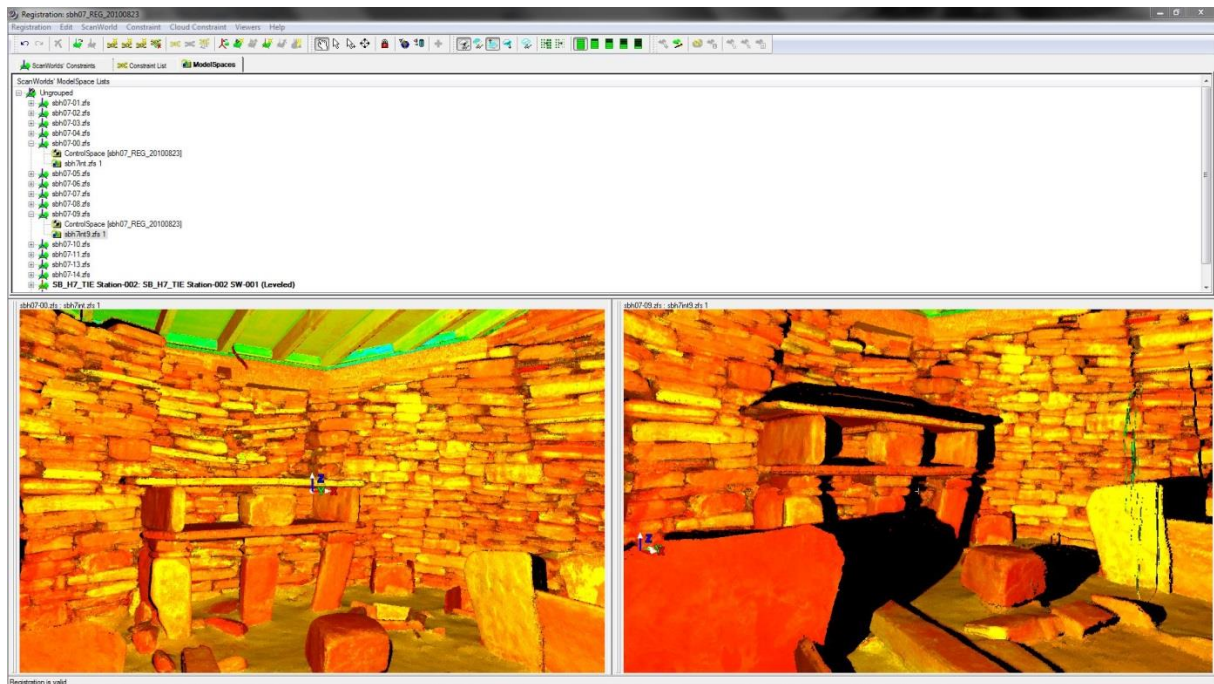
The creation phase of the visualisation workflow refers to the processing and modelling of data and information into a coherent narrative output such as an image or animation. It is difficult to assign specific practices which occur at this stage as each creative process will differ dependent on the nature of

each site and the aims and objectives of each unique project brief. Within the scope of the thesis this stage varied in nature between case studies.

Following the fieldwork stage it is usually necessary to process the data and information collected using a variety of techniques (outlined in Figure 4.3 and Figure 4.4). In the case of the laser scan survey data this was done by firstly aligning any unregistered point clouds to the master point cloud using Leica Cyclone 3D point cloud processing software. The overall accuracy of this process of manual registration relies largely on the practitioner's attention to detail as point clouds are aligned in Cyclone-REGISTER by identifying overlapping matching features between scans (see Figure 4.3, top). Attention to detail at this stage means that the error reading for the final alignment will be smaller and thus the resulting dataset will more accurately represent the dimensions of the real site or structure. At this stage the registered point cloud is 'cleaned', meaning that outlying irrelevant points are selected and deleted from the dataset. These irrelevant points could be anything from an area outwith the focus of the survey, false point trails created by reflections or passing birds, and in the case of heritage sites in particular, people (usually visitors) walking through the survey area (see Figure 4.3, bottom). The next stage in this workflow is to transform the registered and cleaned point cloud into a solid model which can be textured with the photogrammetry data which was collected alongside the laser scans in the field. PolyWorks software was used for this meshing process whereby algorithms within the software triangulate nearby points to create polygons, which together make up a solid or 'water-tight' model (see Figure 4.4). Processing a point cloud dataset introduces varying margins of error as the scans are registered together and 'holes' in the data (caused by blind spots the scanner beam cannot reach and thus cannot gather spatial data for) are filled during the meshing stage.

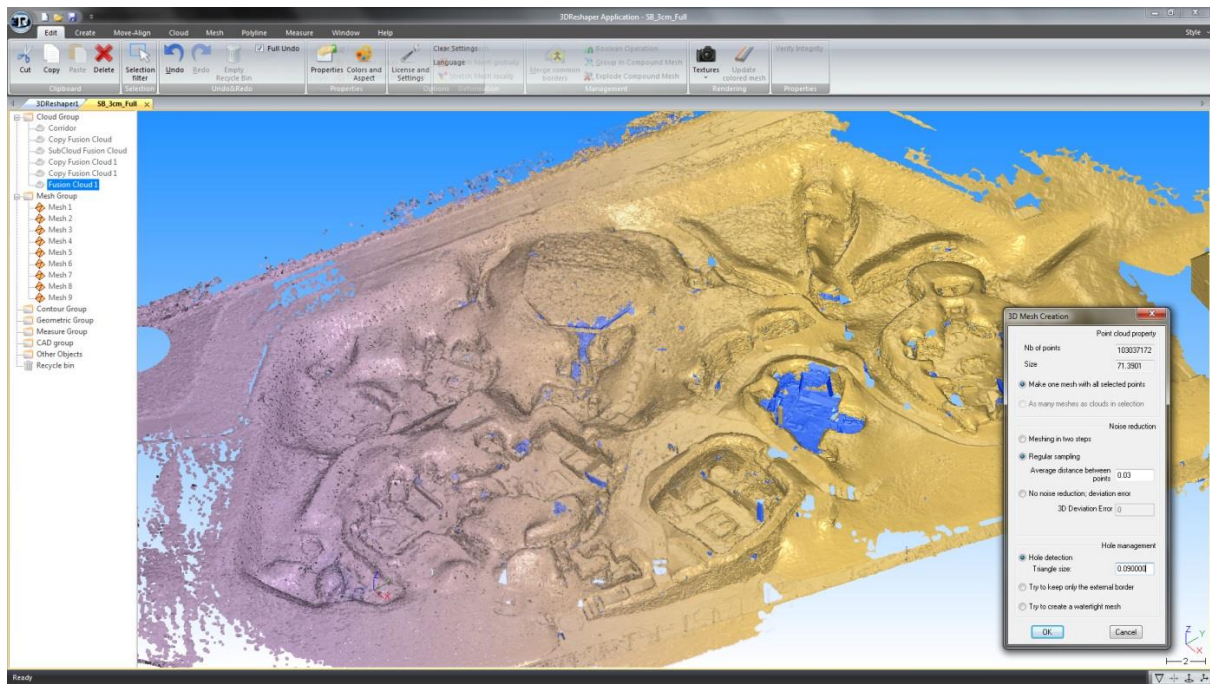
The choice of software is significant for processing scan data, as different software programs have different processing capabilities and the algorithms run in each for cleaning up datasets can vary in accuracy from program to program. As such, the integrity of the original dataset is influenced by this process.

In addition to the laser scan and nodal ninja datasets collected by Historic Scotland photogrammetry data was collected on subsequent site visits to Skara Brae by the collaborative team. Autodesk 123D Catch and MeshLab (which are both free downloadable software) were utilised to process the photogrammetry from Kieran Baxter's kite aerial photography which facilitated the creation of a terrain mesh of the sites and the team's collective efforts to record various artefacts, carved art and smaller scale structural details. In each case multiple photographs of the site, artefact or object were brought into the respective software and taken through a process similar to registration whereby the software automatically matches similar features and points in order to stitch together the digital images.



**Figure 4.3:** Processing laser scan point cloud data in Cyclone software, firstly by ‘registering’ the individual scans together (top), then by ‘cleaning’ any unwanted points from the data (bottom).





**Figure 4.4:** Processing laser survey data from point cloud to mesh (top), then layering photogrammetric data over the mesh to produce a textured model (bottom).

By calculating the positions of the moving cameras for each shot and surface shadows the software is able to generate a three-dimensional textured point cloud or in some cases bypass the point cloud altogether and process the data straight into a solid textured mesh. All of this three-dimensional data can be integrated together into one native file type (usually an “.obj”) which allows the information to be opened and manipulated between different software applications. During this first stage of data processing the practitioner has been dealing with the site as it stands in its present day condition and as such the validity of the data visualisation can be determined against the site itself in terms of error readings. However, the stages which follow this phase in the creation process cannot rely on straightforward measurements to determine their validity, and as such they are deemed to be increasingly subjective in nature the further they progress into visualising a speculative interpretation of how the site may have appeared in the past.

The process of reconstruction began by modelling sections of structures which had collapsed or been lost to the elements over time. At each site this involved speculative modelling of roofs and structural walls to be incorporated into the survey data meshes. The majority of structural modelling and texturing was done in Autodesk 3ds Max which is the industry standard software for most photorealistic architectural visualisation work, providing tools for accurate measurements, three dimensional polygon modelling, animation of cameras, objects and characters, texture mapping complex realistic materials, real-world lighting capabilities to create realistic environments and powerful rendering capabilities for both still images and animations. Although software such as 3DS Max presents very powerful modelling and texturing tools, in some cases architectural style polygon modelling became restrictive. For example, many of the artefacts and structural elements within the archaeological reconstruction needed to be more aesthetically organic in order to appear realistic and blend in with the laser scan mesh, which represented real-world surfaces with imperfections, asymmetry and organic irregularities. As such Autodesk Mudbox software which facilitates free-form sculpting and allows the user to paint textures directly onto a surface was used. During this reconstruction phase calculated decisions had to be made following review of the available literature and current theory with regard to the most feasible structural forms, artefacts and possible interior lighting scenarios to be represented within the visualisation.

Outwith the reconstruction, for the collaborative Skara Brae work a mixture of live action film footage and CGI animation was edited together and a soundtrack composed using Adobe After Effects and Final Cut Pro. This next phase of the creation process shifts the focus to storytelling and the development of a narrative, though it by no means perpetuates a fiction. The process of creating a narrative varied based on the nature of the available evidence, the condition of the site today, the available data, the requirements of the project brief and the intended audience.

#### **4.3.3.3 Consumption**

The film and accompanying exhibition was shown in a variety of contexts between 2012 and 2013 and the format for presentation varied dependent on venue. For example, in December 2012 the film was exhibited in the foyer of the Gregory Building at the University of Glasgow Archaeology Department for one week following an introductory talk by the author. The film was played in a loop and an accompanying display board exhibited a series of stills from the film, images of data and photographs from the fieldwork together with written captions detailing the process and intended outcome of the project. During January 2013 the film was shown as part of an archaeology department seminar presentation at the University of York (also live streamed to the Archaeological Computing Research Group at the University of Southampton) followed by a Q&A session. The version of the film shown at both of these events was without sound. From May to August 2013 the film and exhibition were installed in the old ticket office onsite at Skara Brae, this edit of the film included an ambient soundtrack composed especially for the film by Dr John Was who specialises in prehistoric soundscapes. As noted earlier, feedback from questionnaires was collected from these three venues.

In addition to these instances, the film was also shown from June to August 2013 as part of the Jim Pattison's *Models of Mind* exhibition at the Pier Arts Centre in Stromness, Orkney. For the Pier Arts Centre Pattison's work represented a continuation of their art and archaeology theme, with this particular exhibition focussing on the Neolithic carved stone balls of Scotland, including works which related to the specific artefact used in the final sequence of the *Digital Dwelling at Skara Brae* film. The film was shown in a gallery at the top of the building accompanied by Pattison's relevant Skara Brae artwork. The gallery was a very different context to the locations the film had been previously shown in and the team felt confident in letting the film stand by itself as an art piece without the accompanying *Digital Dwelling* exhibition. However, if visitors to the arts centre did wish to know more about the work a coffee table book was presented adjacent to the screen which held the narrative and select images from the exhibition. It was not felt appropriate to collect questionnaires from this venue and as such only verbal feedback was obtainable.

#### **4.3.4 Ethics and Access**

In the case of fieldwork led by the author outwith the Scottish Ten project site access and permissions were obtained from Historic Scotland. Kite flying, photography and filming at Skara Brae was approved by the district architect for the Northern Isles, the World Heritage site coordinator, onsite staff and relevant land owners. A focus group was held at the Orkney College UHI in Kirkwall which operated in a similar manner to a departmental seminar, opening the floor to questions and discussion after an introductory talk. Permission was granted by the Historic Scotland Communications Team regarding the



dissemination of the final visualisations in various venues and the collection of feedback via anonymous questionnaires was approved prior to the events.

#### **4.4 Summary**

The work compiled and discussed in this thesis does not aim to provide a strict blueprint on how practitioners should conduct visualisation work in archaeology or outline rules to be adhered to, rather it suggests a new approach to thinking about the production of these images as a research process with an intellectual weight. As discussed in the preceding chapter, one of the issues with visualisation in archaeology at present is that often the methodologies for its inclusion in academic discourse borrow too heavily from those methods already established for archaeological practice by more traditional means. This necessity to produce and quantify visual work in the same way as conventional research practice in archaeology restricts the potential of this visual work to be fully appreciated. This research seeks to re-think the way we presently conduct visualisation practice within archaeology at each stage in the visualisation process. The collection, creation, consumption framework of the research design allows for structured analysis and evaluation of engagement with the site and the development of the practitioner's interpretation at key stages in this complex visualisation process. This will be achieved firstly by analysing the use of digital technologies for the process of archaeological interpretation and representation through the St Kilda pilot study, then by applying experimental layering of different mixed-media approaches as a method of engaging with the archaeological site and material and merging subjective with objective by means of the Skara Brae study.

## **5 Case Studies in Reconstructive Visualisation: Collection, Creation and Consumption**

This chapter documents and discusses the case studies conducted as part of this research. Through consideration of workflows and process each case study explores themes surrounding engagement, interpretive integrity and the layering of diverse methods and media.

### **5.1 A Pilot Case Study on St Kilda**

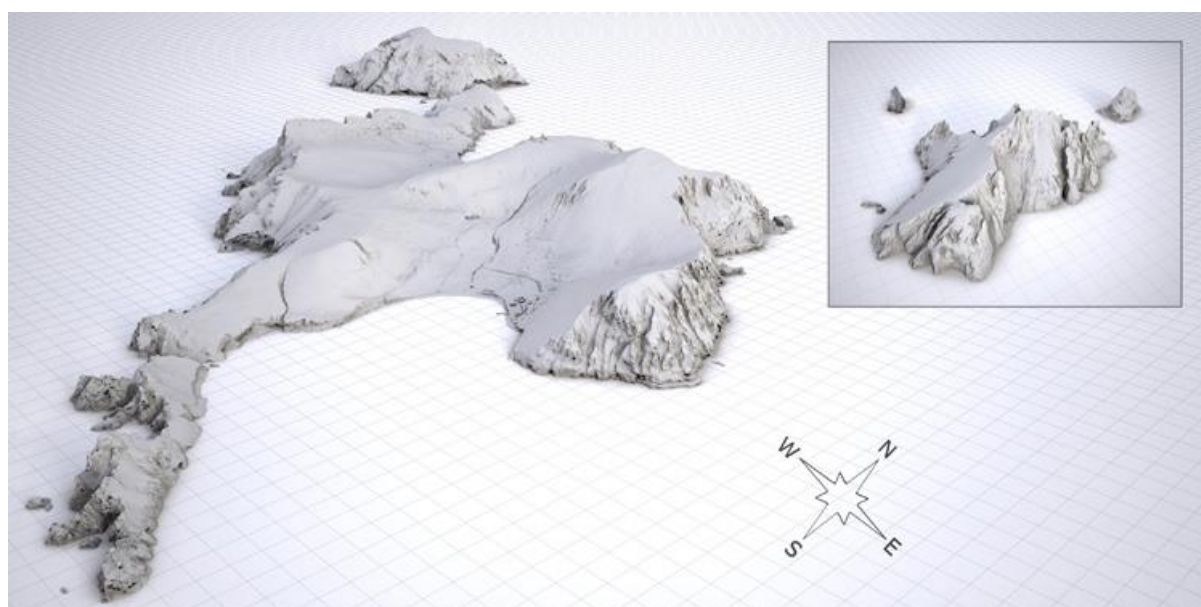
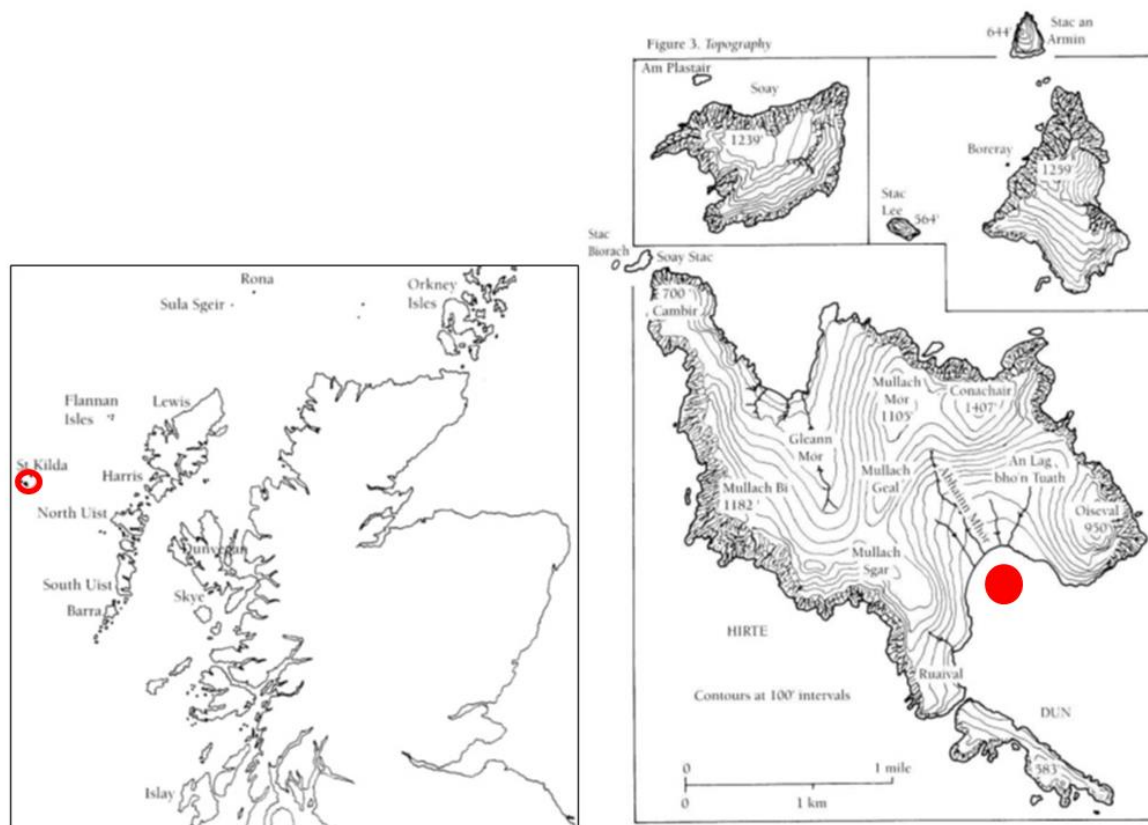
The first case study focuses on the survey of the 19<sup>th</sup> century village landscape on Hirte, the largest island in the St Kilda archipelago which lies approximately forty miles off the Western Isles of Scotland (see Figure 5.1). This group of islands and sea stacs has captured the imagination of travellers and writers since at least the 17<sup>th</sup> century, many of whom made the journey in open boats from the islands in the Sound of Harris. Today the St Kilda World Heritage Site is owned by the National Trust for Scotland (NTS) and is occupied by a civilian force manning an outpost of the Hebrides Missile Range. Over 3000 visitors come to Hirte each year, mainly in the summer, and there are long-standing research and monitoring programmes in archaeology, ornithology and ungulate ecology (Geddes and Watterson 2014, *forthcoming*). The site was surveyed by the Scottish Ten team (including the author) over two weeks between June and July 2011.

#### **5.1.1 Aims**

The pilot project was conducted in order to represent a control study for this research, the aim being to work through the standard systematic means of producing an archaeological interpretive visualisation in order to evaluate three-dimensional digital field survey (in this case by means of scanning and photogrammetry) for interpretation. The study paid particular attention to the extent of practitioner cognition and engagement with the site during fieldwork.

#### **5.1.2 Survey**

Survey was conducted using both close and long range scanning equipment as well as panoramic photogrammetry rigs (see Figure 5.2). The focus of the survey was the major settlement area within the head-dyke boundary in Village Bay, though a select number of additional satellite areas of interest in the further reaches of the island were also included. For example, the Amazon's House and associated structures in Gleann Mòr to the northwest of the island and areas of stock enclosures and peat stripping beyond the village head-dyke in an area to the northeast called An Lag.



**Figure 5.1:** Top left: location map of St Kilda in relation to mainland Scotland (Harman 1997, 3) and top right: a topographic map of St Kilda indicating the location of Village Bay which was the focus of the Scottish Ten terrestrial survey (Harman 1997, 5). Bottom: a visualisation of the aerial LiDaR survey commissioned by the Scottish Ten project (image reproduced with permission of the CDDV).



**Figure 5.2:** Top: using a range of laser and structured light scanners on St Kilda (left: long-range Maptek mine scanner, photo taken by James Hepher and right: Artec MHT close-range scanner, photo taken by the author). Bottom: the registered point cloud of the Village Bay scan data (reproduced with permission of the Centre for Digital Documentation (CDDV)).

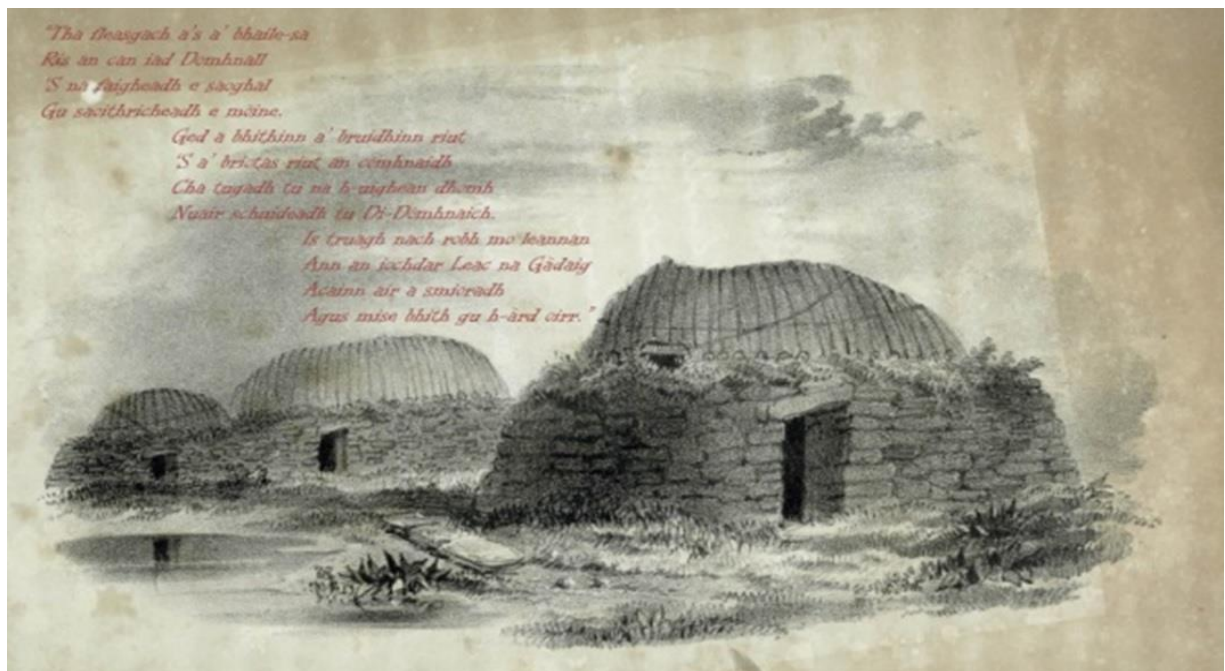
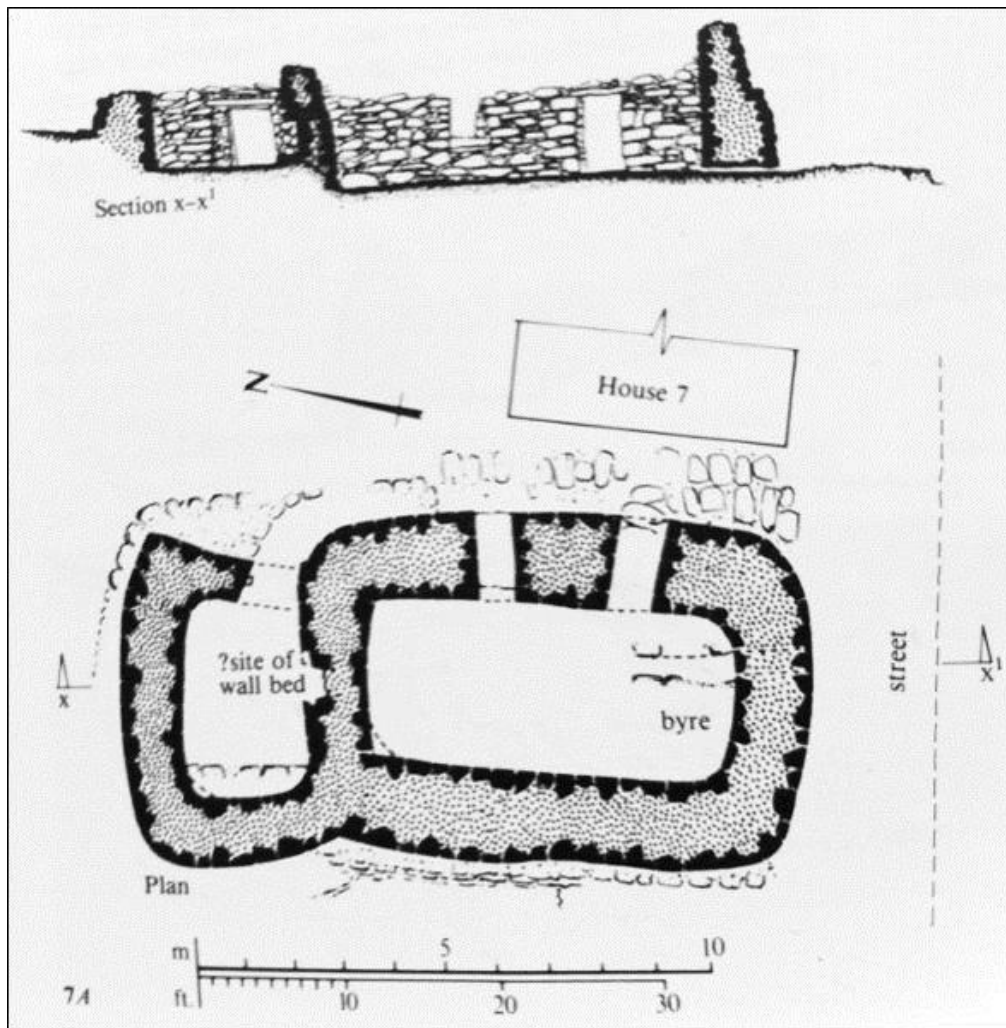


Using a Leica ScanStation C10 with a 300 meter range the main area of settlement within the head-dyke and the area beyond in An Lag was surveyed using a pre-mapped traverse method (as described in Chapter 4) to ensure maximum coverage of the village area. This removed the need to manually register scans together later, which would have increased potential inaccuracy throughout the largest portion of the data. Following daily review of the survey data, a Leica HDS6100 phase scanner was used to record unregistered laser scans in areas the traverse had not reached. Many of these “spot scans” included interiors of buildings, with both upstanding and ruinous remains, and a select number of storage structures known as “cleits.” Both the C10 and HDS6100 surveys recorded panoramic photogrammetric imagery at each scan location. Long-range scanning was conducted at a small number of locations within Village Bay using a Maptek mine scanner. Close-range structured light scanning using an Artec MHT was also employed to document smaller detailed features, such as stone carvings, collecting both spatial and RGB texture data. In addition to these terrestrial scanning systems aerial LiDaR (Light Detection and Ranging) survey was commissioned in order to document the surrounding terrain.

### **5.1.3 Historical Record**

In the past, writers describing Hirte tended to focus on what they viewed as unusual cultural practices (fowling and the associated techniques of climbing) with little focus on the more routine daily life on the island. The nature of the available evidence for occupation of St Kilda largely consists of a vast photographic archive together with a handful of written accounts from various ministers present on the island over the decades (Rev. MacKenzie and Rev. Buchan for example (Munro 1961)). Despite the vast range of literature written about the archipelago, few titles exist which were authored by native St Kildans (one notable example being Gillies 2010), unsurprising perhaps for a community whose heritage was entirely oral, preserved through song and storytelling, most of which have been lost.

This pilot case study focussed on the reconstruction of Blackhouse G (see Figure 5.3) which is situated on the main street within the village area and represents one of the best preserved structures of this type on the island. Once occupied by the Gillies family (Stell and Harman 1988) this drystone structure is one of the second wave of blackhouses recorded on St Kilda, the previous village having been a cluster of structures located further north towards the head-dyke wall before the change to a linear street formation in the 1830s. Blackhouse G would have been built around 1834 and remained in use as a dwelling for at least 25-30 years, until the new cottages were constructed in the 1860s. Following this the blackhouses were re-used as byres and storage structures.



**Figure 5.3:** Top: a plan of blackhouse G (Stell and Harman 1988, 40). Bottom: an early sketch of the pre-1830s blackhouses from the St Kilda archives, reproduced here with permission from the National Trust for Scotland.

The following is a detailed description of the structure from the RCAHMS (Royal Commission on the Ancient and Historical Monuments of Scotland) Canmore monuments record upon which the reconstruction was based:

"The main unit measures 6.76m by 2.9m within walls up to 1.6m thick; the side-walls stand to a height of 1.83m, while the gables are 2.9m high, the external angles of the S end-wall being rounded and the narrower upper parts of the gables being later additions. Cement and tar along the wall-heads indicate the edges of the last roof. The doorway is near the S end of the E side-wall and beneath its paved threshold runs a drain. The lintels of the window-opening a little to the N in the same wall are missing. Two pieces of iron project from the W side-wall near the floor; neither has a ring, but they are likely to have been used for tethering beasts. A drain runs beneath the S end-wall and under the street. At the N end the lower parts of the adjacent inner wall-faces are not bonded, and there is a large lintel-like stone in the N end-wall but no clearly defined associated jambs. Internally, the N unit measures 3.74m by 2.62m, the walls being up to 1.22m thick and the angles rounded. The doorway, which is at the S end of the E wall, has outer and inner lintels of stone and timber respectively, and contains the post and lintel of a wooden door-frame. At the W end of the interior there is a narrow platform 0.28m high. Part of the S side-wall, adjacent to the N gable of the main building, collapsed in 1984, revealing part of a lintelled aperture and wall-face within the thickness of the wall. This probably represents the remains of a passage leading into a crib or wall-bed, the newly revealed wall-face probably being part of the inner wall of the bed chamber itself. The chamber was presumably destroyed when the N building was added, and the crib entrance covered or removed when the N wall of the main building was refaced, hence the lack of bonding at the internal angles. This building is noted on Sharbau's plan as having a bed in the wall."

(Stell and Harman 1988, 40-41)

#### **5.1.4 Reconstructing Blackhouse G**

Following registration of the HDS6100 scans with the larger point cloud collected from the C10 traverse the amassed point cloud was cleaned of any irrelevant data (for example tourists passing by and trails created by flying birds) in Cyclone software, then meshed in Polyworks (as previously outlined in Figure 4.4, Chapter 4). The result of this process was a medium-resolution solid model of the relevant section of the village street including the standing remains of blackhouse G (pictured with additional reconstructed elements at the top of Figure 5.5). Architectural reconstruction was referenced from external photographs from the National Trust for Scotland archive, though unfortunately these only date to the early 20<sup>th</sup> century when these pre-1860s blackhouses were no longer occupied. As such, much of the



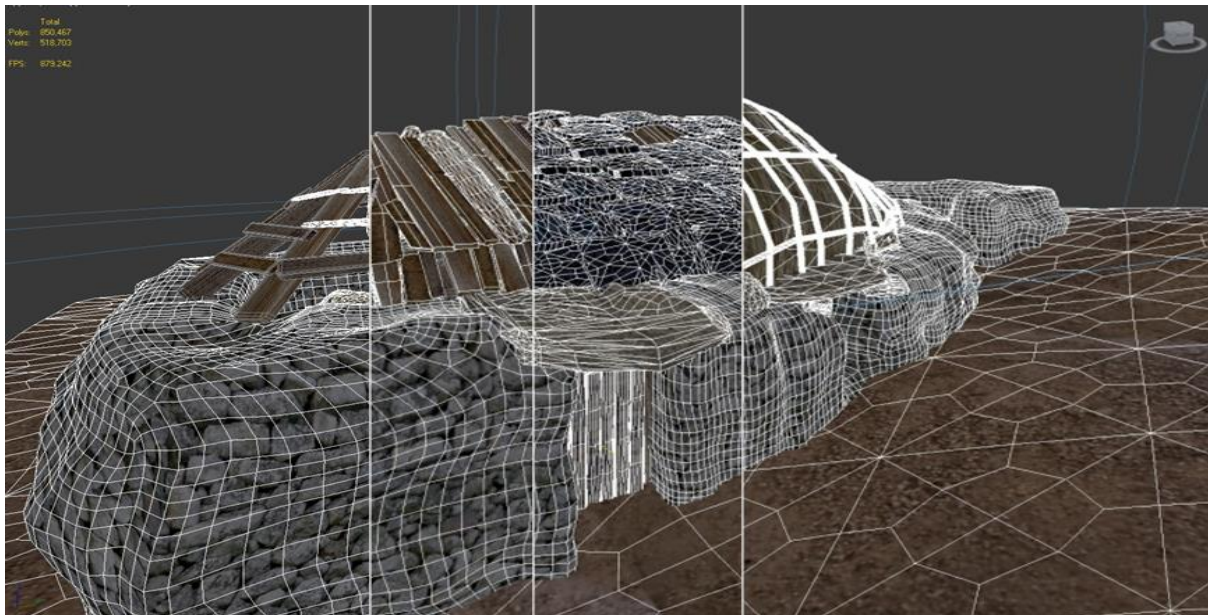
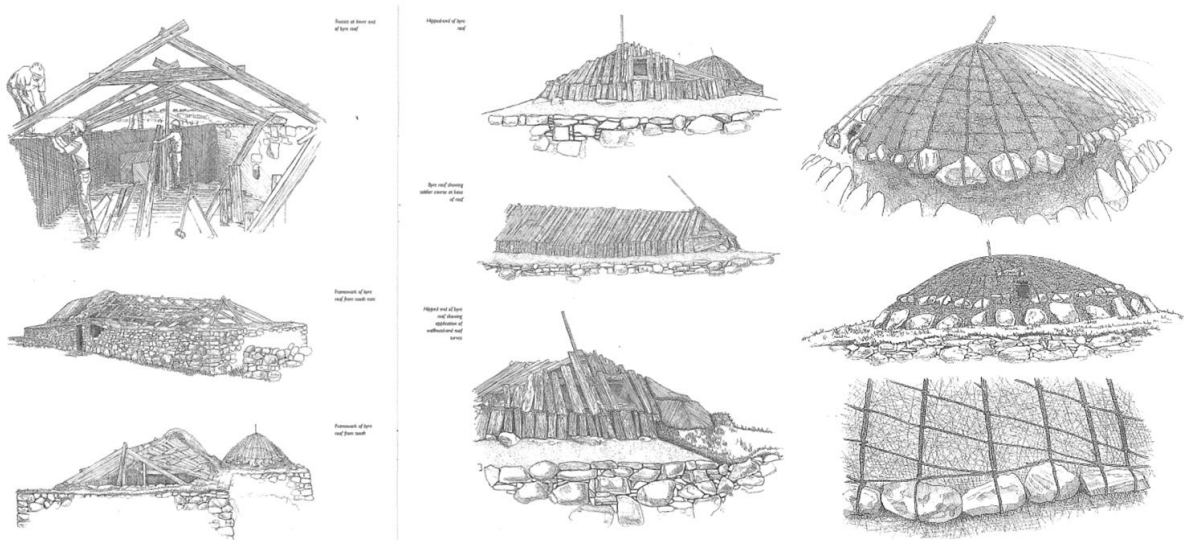
structural references for the reconstruction came from the blackhouses at Arnol on Lewis (Walker and MacGregor 1996) which provided a useful Western Isles parallel for reconstruction, particularly with regard to the construction of the roofing materials.

During the initial stages of reconstruction modelling the blackhouse roof proved to be unexpectedly problematic. Following the abandonment of the St Kilda blackhouses as dwellings in the 1860s their rounded gable ends were remodelled into a peaked form to facilitate A-frame supported bitumen roofing replacing the traditional rounded peat and thatch (see Figure 5.4). As such, because the laser survey represents the site as it stands today, the traditional form of the blackhouse sought for the reconstruction was compromised. Within the project this particular issue was fundamental to demonstrating the ways in which engagement is facilitated between the practitioner and the site during digital survey. Had a manual form of survey been conducted it would have become apparent that the wall had been modified as the additional new coursing would have had to be differentiated in the drawing. Self-reflexive analysis of the fieldwork reflected that the process of conducting a laser scan survey has the effect of creating a very abstracted impression of the site with limited interpretive consideration for the structures. This is due to the nature of this type of digital survey which is concerned only with maximum surface coverage of the site, an attribute which encourages a view of this mode of data collection as being objective. This positive reinforcement of perceived objectivity has the negative effect of distancing the fieldworker from their subject given that no interpretative elements are required to successfully complete the survey. This is particularly problematic if this type of fieldwork is the sole basis for a reconstructive image.

The remaining reconstruction consisted mostly of 'set dressing' the interior based upon the archaeological record of finds, written descriptions and parallels to similar blackhouses on Lewis (see Figure 5.5). A fairly typical systematic workflow was followed to produce this visualisation, whereby spatial data was collected and processed, reconstructed structural elements developed and the interior dressed with furniture and artefacts. Though a woman is represented she acts only as a mannequin for period costume, there is no agency to her presence. Although this type of image does serve to represent the physicality of the blackhouse, display artefacts in context and introduce a sense of place it lacks any real depth of time or lived experience. Within this type of statically framed archaeological reconstruction it is difficult to represent any richer sense of intangibility, wider context or agency.

#### **5.1.5 Workflow**

Engagements with archaeological sites are often dominated by vision, but our embodied experience of these places is intrinsically multisensory.



**Figure 5.4:** Top: images from the St Kilda archive with re-modelled gable ends circled in red (photographs reproduced with permission of the National Trust for Scotland (NTS)). Centre: blackhouse maintenance diagrams (Walker and MacGregor 1996, 6-15). Bottom: cutaway screen-shots of the blackhouse model in 3ds Max detailing construction of the roof (author).





**Figure 5.5:** Top: the resulting blackhouse reconstruction placed within the context of the laser scanned village street (author). Bottom: an internal view of the blackhouse (author).

A consequence of this isolated visual approach is that the methods employed to record sites and landscapes (e.g. survey, photography, laser scanning) tend to distil the lived and dynamic experience of a place into static and silent data. Furthermore, this systematic way of working factors in little space for interpretation to develop. Digital capture techniques, laser scanning included, only record the surface of a structure, but visually understanding a site goes further than morphology alone. In reality humans engage with the morphology of a site on both a physical ('choreography' of the site on a person's experience of moving around a space) and a personal level (the emotional response to a site). However, interpretive visualisation of these types of data is rarely taken past the initial morphology stage, with few projects encouraging active engagement with the site as part of their planned methodology. Renfrew (2003, 42) believes that too often researchers are prone to suppress these immediate sense impressions. Although he acknowledges that they are subjective and may not initially accord with notions of the objectivity of scientific endeavour, he believes that maximising the range of experiences and impressions practitioners undergo and record in the field enriches the process and outcome.

The workflow for the fieldwork and processing was systematic with little deviation from a linear pipeline (see Figure 5.6). There was little interpretation involved in the fieldwork save for an initial desk-based review of the site layout when designing the methodology. Engaged interpretation is not factored into this workflow at all in the field or during the post-processing stage.

Familiarise with layout of site → design survey methodology → survey site → review data → 'hole-fill' → register data → clean data → mesh data → clean data → visualise data → disseminate

**Figure 5.6:** The workflow for the St Kilda fieldwork.

#### **5.1.6 Collection Summary**

Although brief, this pilot case study encouraged consideration of the kinds of information and interpretation which are revealed and obscured by current archaeological survey and visualisation practice. Fieldwork with the Scottish Ten project observed that there seems to be a relationship between automated techniques of digital data capture and the extent to which the practitioner engages with the archaeology of the site. Digital data capture techniques for three-dimensional visualisation can influence and even constrain the kinds of information that are observed and recorded, accommodating little space for any kind of interpretive process or relationship with the site to develop within the recording process in the field. Although it is impossible to deny that these mechanised digital survey techniques provide an unparalleled surface record of the site, the reduction of interpretive engagement in the field (justified by a desire to remain objective) proves restrictive to the interpretive process in cases where this data is

utilised in further interpretive visualisation of the site. While it is not necessary to inject subjective engagement into the digital survey workflow itself, when producing interpretive visualisations it is fundamentally important for practitioners to engage with the site in additional ways, avoiding using these digital methods in isolation.

## **5.2 Digital Dwelling at Skara Brae**

The Skara Brae case study was initiated following concerns raised during the pilot study whereby automated survey techniques were observed to mediate and mute interpretive engagement onsite when these digital methods were used in isolation. Furthermore, additional reflexive evaluation suggested that analysis of the author's process alone was not conducive to effectively evaluating the visualisation process in the context of this research. Consequently, a small team of specialists working in the field of heritage visualisation was assembled, project managed by the author.

### **5.2.1 Aims**

This case study develops a methodology which merges systematic data collection of the kind utilised in the pilot study with active engagement with the site using a range of additional methodological and technical approaches. Additionally the case study also addresses collaborative working as a means of further evaluating the visualisation process; thus facilitating observation of additional interpretive visualisation methods and allowing reflection upon the author's own practice. By combining site visits with laser scanning, photogrammetry, kite photography, film, painting and drawing, the collaborative team aimed to generate a unique and dynamic visual interpretation of this enigmatic prehistoric site.

The project aimed to develop a means to move beyond the disembodied digital perspectives which had become problematic for interpretation on St Kilda when recording and picturing the past in the present. This case study represents both a practiced example of the value of collaboration in this field and a demonstration of visualisation as a process of interpretive discovery by facilitating the creation of a dialogue of enquiry between the practitioners and the site. In the process, it seeks to address the observation made in Chapter 3 that the partnership between traditional approaches to survey and site interpretation and more creative, subjective and experiential post-processual approaches is an area under-explored in archaeological practice.

### **5.2.2 Introducing Collaborators**

Each participant on this collaborative project brought a unique skill, outlook and methodology to the case study which facilitated the layering of multiple methods and approaches to interpretation as part of the film's production.

### **5.2.2.1 Aaron Watson**

Dr Aaron Watson is an established artist and archaeologist whose work explores the ways in which creative application of multimedia, from painting to digital artistry, can inform archaeological interpretation (examples of Watson's work pictured in Figure 5.7). Watson's previous body of work focuses on the materiality and multisensory experience of Neolithic and Bronze Age sites in the British Isles on a landscape scale by considering how unfamiliar and artistic approaches have the potential to 'manifest new pasts'. Much of his work adopts an abstract approach to the representation of past peoples and places, using bright colours, cubism and photo collage to express and emphasise the more intangible side of the archaeological record as well as new ways of seeing established interpretations. Aside from the final creative output, a particularly compelling aspect of Watson's work is his field method. His way of engaging with the site is deeply rooted in experiential and sensory methodologies, valuing elements such as acoustics as being no less relevant than vision (see Watson and Keating 1999, 2000, Watson 2001b). He notes that it is only by acknowledging and identifying the diverse sensory qualities of sites in their landscape setting that we can at all begin to theorise upon what their values and meanings might have been in the past (Watson 2001a, 297).

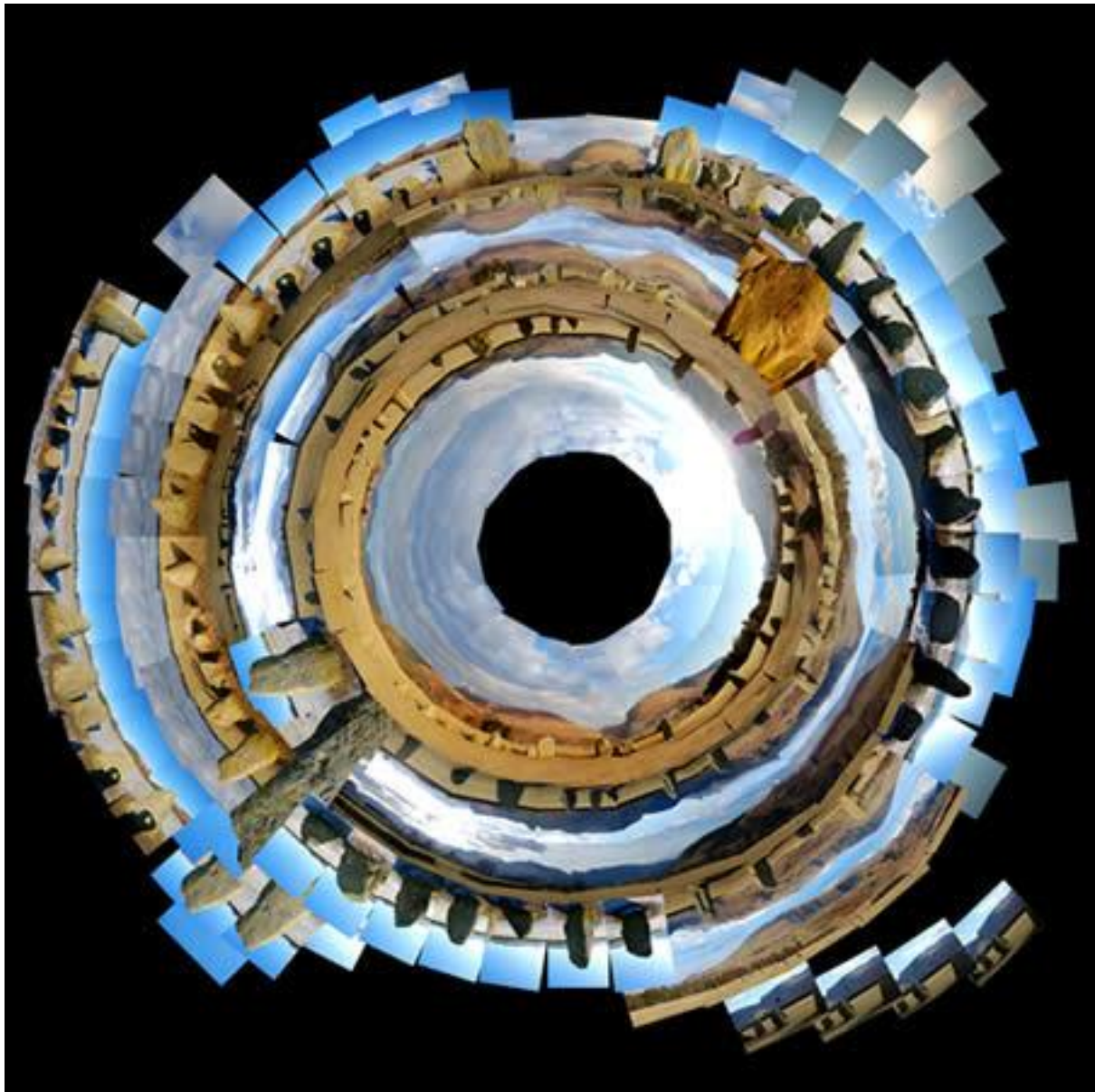
### **5.2.2.2 Kieran Baxter**

Kieran Baxter is skilled in kite aerial photography, and is presently researching the role of aerial perspectives and animation within heritage presentation at the Duncan of Jordanstone College of Art and Design (University of Dundee). Chapter 2 introduced the theme of obtaining different perspectives through multiple types of archaeological photography and Baxter's work is an excellent example. His work experiments with the revealing and transformative nature of the aerial view, aiming to better understand the ways in which an emerging array of aerial platforms and digital image processing techniques can be used creatively to disseminate ancient heritage sites and their accompanying archaeological narratives (see Baxter 2012 and Figure 5.8 for examples of Baxter's work).

### **5.2.2.3 John Was**

Dr John Was is a composer and music academic whose compositions are inspired by ancient monuments and their environmental settings. His current academic research focuses on what it is to be human and musical. He currently specialises in the creation of audio installations and of film sound tracks, where sound melds with architecture, image, and light to produce a living, undulating sense of place. Was provided the soundtrack for the resulting visual outcome, though unfortunately he was not able to be present during the fieldwork and composed the score once the short film had been finalised.





**Figure 5.7:** Top: Watson's photo collage of Castlerigg Stone Circle (*Stone Circle Vision* 2006) depicts the entire monument together with the mountainous backdrop of the Cumbrian landscape and infinite sky. This view of the entire monument at once from such a perspective is not possible in reality, thus Watson's work succeeds in transcending both time and space in a single image, a quality which he believes effectively reflects his engagement with the site (Watson 2004, 92). Bottom: Watson's installation the *Kilmartin Eye* (2007) explores a different space for interpretation to exist in between archaeology and art, method and imagination and invites the visitor to engage with the interpretation of the prehistory of the Kilmartin Glen landscape (Watson 2008, 147).





**Figure 5.8:** A visual breakdown of Baxter's Jarlshof project<sup>6</sup> (2012) in Shetland which demonstrates his method from kite aerial photography, to point cloud, meshes and finally an animation with reconstructed elements incorporated.

<sup>6</sup> The full Jarlshof film is available online at <http://vimeo.com/kieranbaxter/jarlshof>

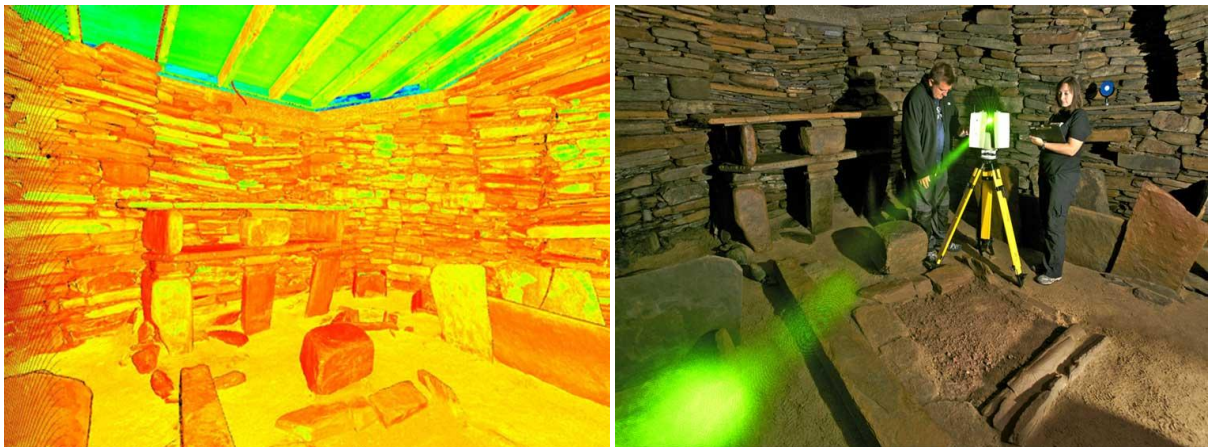
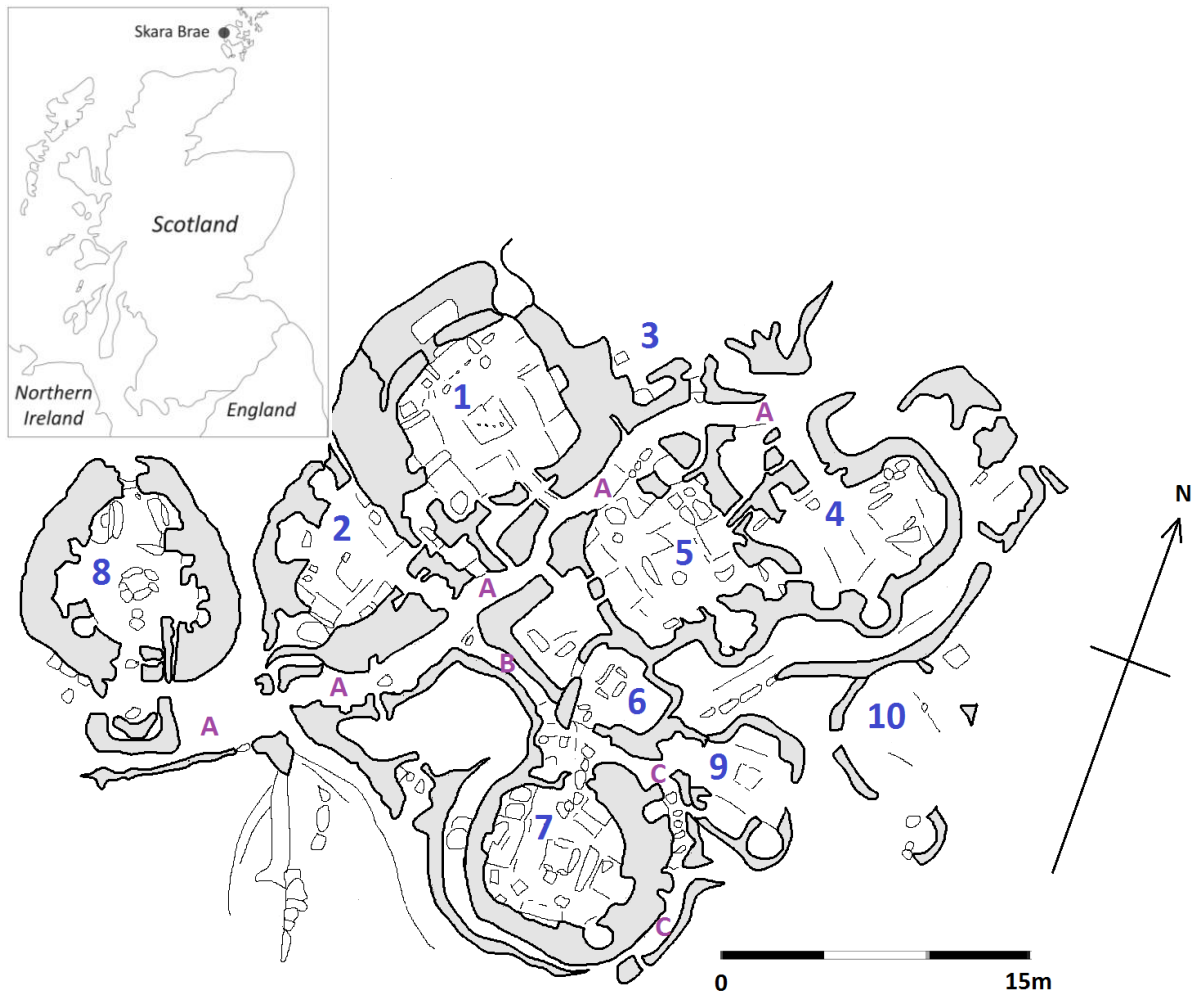
### 5.2.3 Archaeological Background and Survey

Located in Skaill Bay, Mainland Orkney, Skara Brae is a late Neolithic settlement whose level of preservation is unparalleled elsewhere in Scotland. Uncovered in 1850 when a fierce storm eroded the sand dunes surrounding the structures, the village represents an integral part of the wider prehistoric landscape of Orkney. In the decades following its discovery the site was subject to sporadic and to some extent inadequate excavation and recording led by Vere Gordon Childe (Childe 1931 and 1950), where much valuable evidence was disregarded and lost. As a result much of the scholarly investigations of the site have been limited to architectural and stratigraphic observations, speculating over roof construction and the sequencing of earlier and later phases of the village and its structures (for example Clarke 1976). The site is now set within an extensive World Heritage landscape which comprises a remarkable group of monuments including Barnhouse, Maeshowe, the Ring of Brodgar and the Stones of Stenness (Downes *et al* 2005).

The site was chosen as the focus of this particular collaborative project for a number of key reasons. For one, the site's excellent upstanding preservation meant that it was a suitable candidate for both laser survey and kite aerial photography. Additionally, having previously been surveyed using laser scanners and photogrammetry rigs by Historic Scotland as part of the Scottish Ten project (Wilson *et al* 2011) there was an abundance of data to be utilised and evaluated using an interpretive and creative methodology (see Figure 5.9). In this case the author was not present in the field during the Scottish Ten fieldwork, though the implications of this absence were not felt to have restricted the project in any way. As was discussed earlier, laser scanning is largely an automated process which affords little meaningful engagement with the site during survey. As such, because this survey technique remains largely objective, any engagement with the site which may influence the production of interpretive visuals is not directly gained from being present in the field during this process. In order to be engaging and useful in an interpretive context scan data must be supplemented by additional visual and methodological approaches to recording and interrogating the site. However, these engagements do not have to always occur in direct contact with the laser survey fieldwork to be effective.

The complexity of the site with its winding passageways, iconic dwellings, the way later phases of the village were dug down into a midden of accumulated domestic waste, together with the limited access and fragmented interpretation, make it difficult for visitors to understand and provided a challenging context within which to conduct this collaboration. Although the site could feasibly have been re-created from scratch using three-dimensional modelling software, laser survey proved to be invaluable in capturing and conveying an authentic sense of place architecturally.





**Figure 5.9:** Top: map locating Skara Brae and identifying the different Huts within the village (modified from Richards 1991, 26). Bottom: laser-scan survey of Hut 7 at Skara Brae by the Scottish Ten team in 2010 (images reproduced with permission from Mike Brooks and the Scottish Ten project).

The 'organic' nature of drystone construction is difficult to achieve when modelling from scratch, as the software used (for example Autodesk 3ds Max) is largely geared towards modern architectural forms, basing much of its primitive geometry generation on straight lines and measured angles. As such it would have been too labour intensive for the time-scale of this project to model from the ground up.

The project was very much research and process-led rather than focussed on the final visual outcome, though a consideration of potential audiences was important and the team were conscious that today the visitor to Skara Brae is presented with the somewhat unusual and distanced perspective of looking down into the village from above. It was therefore felt that the explorative nature of the proposed visualisation could provide the visitor with a more experiential and involved perspective of the site than was currently available.

#### **5.2.4 Focus Group**

The week of fieldwork began with a focus group in the Archaeology Department of the Orkney College, UHI in Kirkwall. The purpose of the focus group was to bring together Orcadian archaeologists familiar with Skara Brae and contemporary sites through their own work to discuss the interpretation and representation of the site in the context of domestic life in late-Neolithic Orkney. The group were asked what elements they would like to see represented in the Skara Brae visualisation then queried on how they use visualisation in their own research and where they believe interpretive issues occur.

Interestingly, their answers were not in terms of activities and artefacts, but more in terms of the emotive side of life in the past. They were interested in seeing a piece of work which reflected how the site was experienced, how the architecture influenced the inhabitants movements and how the village came together in the context of the wider Neolithic landscape. Feedback from the group suggested that many felt restricted in their previous experiences utilising visualisation in an interpretive context by the necessity to adopt one static viewpoint, be that embodied or disembodied. Furthermore, although they could appreciate the value of the more creative and embodied approach to visualisation and the interpretation of archaeological evidence, their main concern with the use of reconstruction or visualisation as part of their research output was consequently then having to defend the image against criticism once it was published.

Having considered the results from the focus group, the issues raised and suggestions made, a guideline brief for the collaborative fieldwork was developed. Appreciating that many archaeologists remain concerned about the subjectivity of their interpretations the team chose to base the fieldwork around an already well-established narrative. In Richards' 1991 paper *Skara Brae: Revisiting a Neolithic Village* he gives a detailed interpretive account of the journey through the village entering from the east and

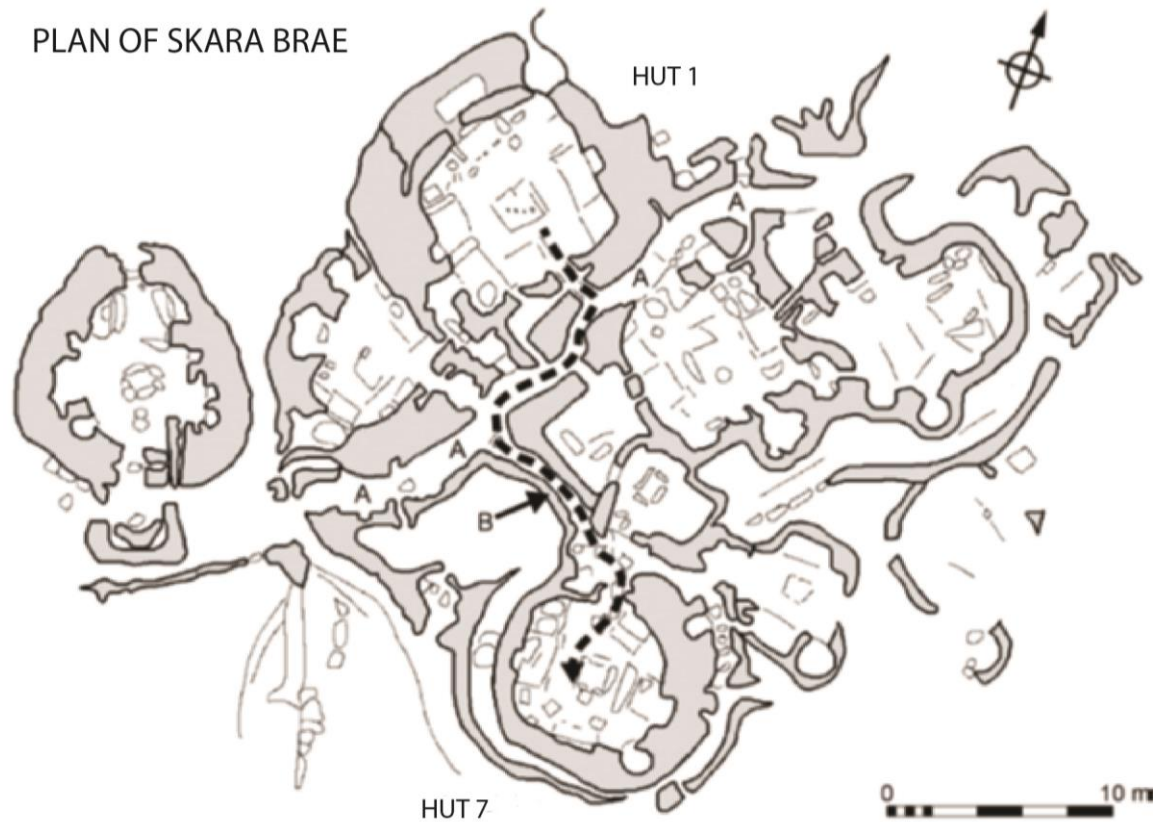
moving through the passageways towards Hut 7 (see Figure 5.10). These paragraphs formed the backbone of the film narrative and helped to shape the way the team conducted their time on site.

“After turning the corner and passing the entrance to Hut 6 (which is a later addition), the passageway suddenly expands and becomes highly decorated. Where Hut 2 leads into this area of Passage A, two features serve to separate it from this apparently important area. First, an elaborate porch-like addition to the entrance separates the hut doorway from the main passage. Second, both sides of the porch area are decorated. It is clear that this portion of passage A constitutes a space of special concern, or even risk. Interestingly it also marks the beginning of Passage B and the journey to Hut 7... It is exactly at this point that further incised decoration is seen on the wall. Continuing along the passage a second upright sill slab marks another step down which coincides with more elaborate decoration on the right-hand wall face. The final step down places the subject in a substantially broader and higher area known as Passage C. Directly ahead is the entrance to a small cell within which the door bar of Hut 7 can be controlled.

On entering Passage C a further upright sill slab is stepped over, and to the left the entrance to Hut 7 becomes visible. A flagstone path now leads directly along the passage and into the entrance passage of Hut 7. Proceeding along this pathway involved a gradual descent and the crossing of another upright sill slab, before reaching the doorway of Hut 7. This area was also decorated by a carved stone set high up in the passage wall... In reaching this point from Passage A, a descent of almost one and a half metres has been undertaken, and no less than five sill slabs and four areas of decoration have been negotiated.”

(Richards 1991, 31)

As Richards shows here the journey to Hut 7 through the village involves the inhabitant or visitor moving through a number of spatial divisions which are punctuated at various significant points with incised decoration. He observes that within Skara Brae, architecture and art often fuse to create greater symbolic and spatial depth, the inhabitants seem to have utilised boundaries to embody temporality through the transitional movement of people through the space. So here we have not simply a cluster of domestic dwellings, but a series of complex divisions of space made more significant by art and physically challenging architecture. In order to facilitate the aerial perspective from the kite photographs, the film begins with a flight down into the village, reaching the ground in Hut 1. Once the camera reaches the ground and passes through the doorway of Hut 1 into Passage A the protagonist begins to follow Richards’ narrative towards Hut 7.



**Figure 5.10:** A plan of the village at Skara Brae detailing the route of the film from Hut 1 down passage A and into passage B, concluding in Hut 7 (modified from Richards 1991, 26).

### 5.2.5 Fieldwork

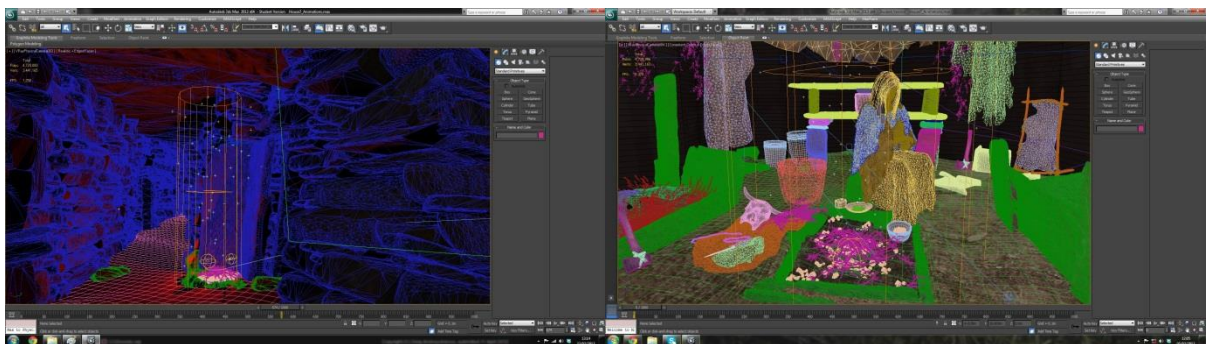
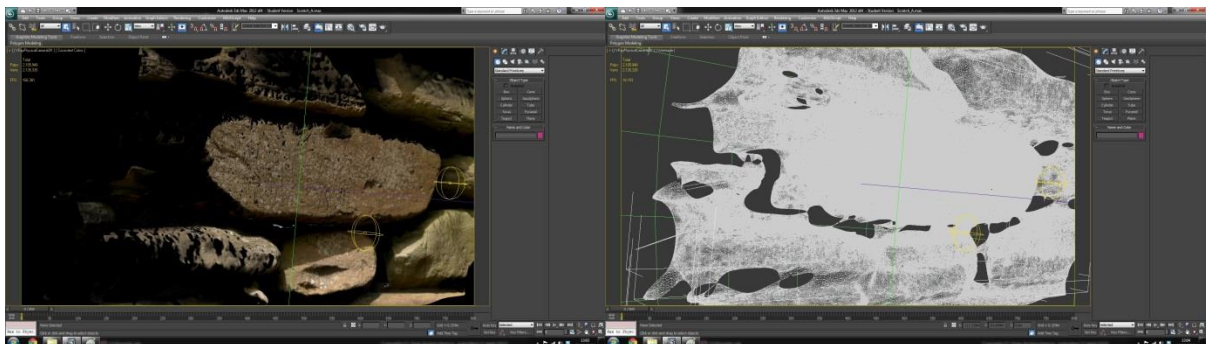
Richards' narrative formed the core structure of the brief, though each member of the team began engaging with the space in different ways (see Figure 5.11 and Figure 5.12). The author focussed on the choreography of the village architecture, in particular the ways in which the passageways, boundaries and doorways manipulated and controlled progressive movement through the site. Baxter found the somewhat chaotic process of kite aerial photography useful as a means of observation which helped to build a familiarity with the site and encouraged an intuitive response to the composition of settlement and surroundings.





**Figure 5.11:** Select images from the *Digital Dwelling* fieldwork. From top left: kite photography at Skara Brae (photo by Kieran Baxter) and within the wider landscape at the Ring of Brodgar, recording paradata in the field (photos by Aaron Watson) and relating the relevant literature to features within the site (photo by Kieran Baxter), filming within the village (photos by Kieran Baxter), kite photography at Skara Brae (photo by Aaron Watson), conducting photogrammetry in the wider landscape at Cuween chambered tomb (author), the author's painted hands with a replica carved stone ball during filming (photo by Aaron Watson) and a visit to the nearby Neolithic site of Barnhouse (author).





**Figure 5.12:** Some examples detailing the technical processes used for much of the digital work, from top: stitching kite images together, producing a textured mesh of passageway scratch art from photogrammetry (Kieran Baxter), and modelling various internal elements of the village, merged with laser scan survey data (author).

Aside from the aerial photography Baxter was intrigued by capturing some of the rock art decorating the interiors using close-up structure from motion photogrammetry, considering of the role of lighting as a narrative mechanism to convey an atmospheric mood or tension.

While the author and Baxter had initially remained very visual in their engagement with the site, Watson's research into archaeoacoustics (see Watson and Keating 1999) drew him to consider the acoustic properties of Hut 7, in particular the resonance of the dresser. He sought alternative methods for recording and communicating by using mixed-media and painting to explore a portrayal which sought to convey animation, ambiguity and even abstraction as an integral element within team's collective interpretation of Skara Brae. Aside from painting and live action filming, much of Watson's contribution to the film came from his approach to engaging with the site and landscape, encouraging the team to discuss the representation of the wider context and reflect upon their modern preconceptions of Neolithic life.

The act of seeing and associating oneself within a space takes time, and that time is important in allowing the practitioner to begin to become aware of their own subconscious interpretive process. The team's engagement with the site developed in a way which meant that each person no longer felt so reliant on drawing modern parallels in order to theorise upon the function and significance of the structures. As Bradley (1997, 71) notes, what we are able to recognise in the field relies almost entirely on what we have seen before. Drawing parallels and seeing the world in the simplified shorthand of our modern perspectives feels natural to us. Essentially the process of 'dwelling' relies very much on unlearning a practice which is engrained in our subconscious.

### **5.2.6 Narrative**

The narrative arc of the film moves from the present day to the imagined past, from a remote aerial perspective to an embodied encounter deep within the walls of the village, and from objective interpretation to creative storytelling. Was' soundtrack reflects the visual development of the film. By using a mixture 'foley' or ambient sounds and atmospheric music to build tension within the film Was shapes the audience's experience through the narrative visuals. The following section outlines the development of the film's narrative as it moves through a series of six broad interpretive themes. The accompanying storyboard can be seen in Figure 5.13a-e (see also Watterson *et al* 2014).





*The film opens with views of the sea cliffs near Skara Brae, serving to situate the site within the wider landscape.*



*The camera then fades into a gentle flight down towards the remains of the site as they stand today. This aerial view is high enough to establish the site within its immediate surroundings while at the same time being low enough to allow features within the village to be recognisable.*



*This aerial shot spirals down past the eye level where a present day visitor may stand then continues into Hut 1, the most iconic of the visible houses on the site today.*

**Figure 5.13a:** A screenshot storyboard of the *Digital Dwelling* short film.





*Once on the ground, the camera passes out through the doorway to Hut 1 and begins Richards' (1991) journey through Passage A, pausing to acknowledge scratch art along the walls which is re-lit with flickering firelight.*



*The camera turns sharply and begins the downward struggle through Passage B. Hands reach out to guide the protagonist through the dark tunnel, giving the impression that the narrative is becoming increasingly more embodied and experiential.*

**Figure 5.13b:** A screenshot storyboard of the *Digital Dwelling* short film continued.



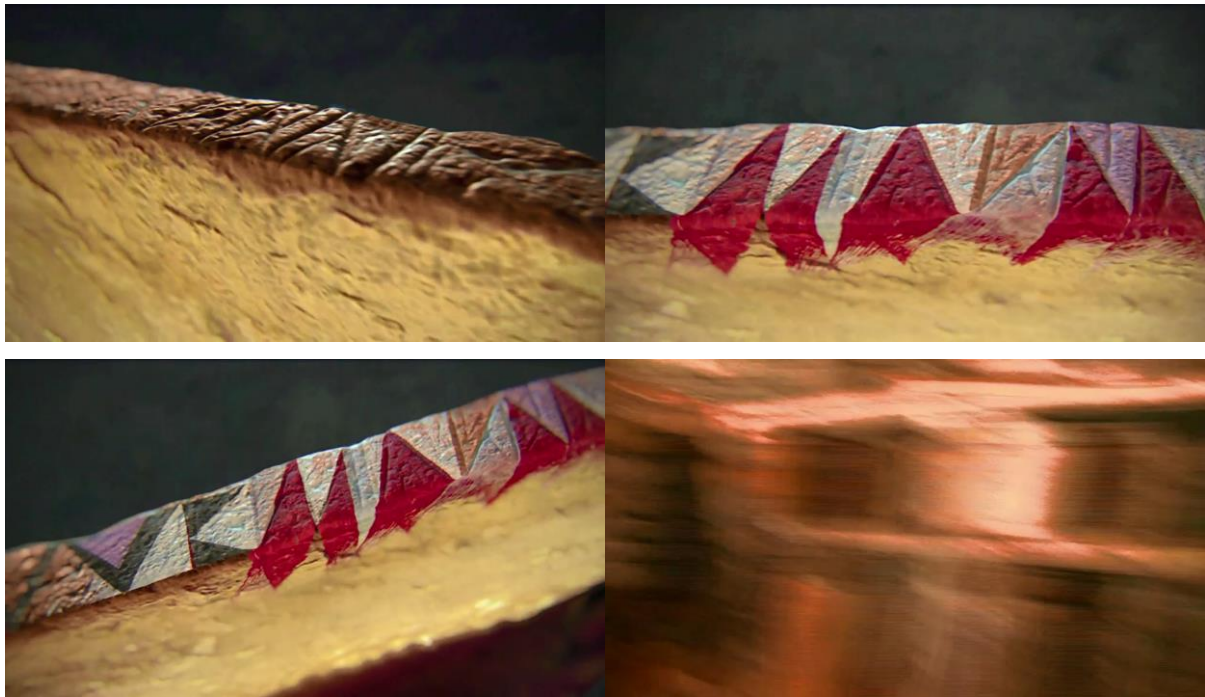
*As the protagonist approaches Hut 7 a fire becomes visible at the entrance. Fireplaces are a familiar feature at a number of Neolithic buildings in Orkney (Richards 2005) and here it is used to emphasise a transitional boundary as the protagonist enters Hut 7.*



*Once inside Hut 7 the protagonist encounters a seated figure sat within the reconstructed structure, surrounded by associated material culture.*

**Figure 5.13c:** A screenshot storyboard of the *Digital Dwelling* short film continued.





*The camera cuts away to a sequence which takes a closer look at the right hand side 'bed' which has been deeply incised with scratch art, reimagined in brightly coloured pigment.*



*From this point the experience becomes disorientating, strange and other-worldly as the camera returns to the seated figure who rolls a carved stone ball in her hands, which themselves are brightly painted with abstract designs.*

**Figure 5.13d:** A screenshot storyboard of the *Digital Dwelling* short film continued.





*As the camera focusses on her hands, she passes the object to the protagonist, concluding a journey which began with an aerial landscape view and ends with a transformative encounter with a place, a person and an artefact, from a macro to micro scale.*



*The film concludes with views of Skail Bay, returning the audience to the present day.*

**Figure 5.13e:** A screenshot storyboard of the *Digital Dwelling* short film continued.

#### **5.2.6.1 Context**

*The film opens with panoramic views of coastal cliffs framing a turbulent ocean. The light is luminescent and sea birds soar through the sky. See Figure 5.13a.*

While collecting material for the film, the team visited many locations across the wider landscape, believing that it was important to engage with a diverse range of sites, many of which were contemporary with Skara Brae. The original intent was to integrate some of these wider visual and architectural references within the film, but this ultimately proved too disruptive to the overall flow of the narrative. The live-action footage of the sea cliffs above Skaill Bay remain as one of the few elements of the wider landscape to feature in the film as views like these may have been familiar to the inhabitants of Skara Brae.

#### **5.2.6.2 Disembodiment**

*The aerial perspective from the cliffs fades into a gentle flight down towards the remains of Skara Brae as they are seen today. The camera approaches the exposed interior of Hut 1 and, passing through the eye-level of the visitor on the modern-day path, spirals down to the level of the village. See Figure 5.13a.*

This shot combines kite aerial photography, laser scan data and live action footage. Low level aerial photography was used to capture detail and lighting which was later draped over a digital mesh generated from the laser scan data. To maintain an unbroken sequence as the camera encounters the confined interior space the computer generated elements were blended into live action footage using match-moving software. While the shot was achieved by combining imagery from somewhat contrasting methods (a kite and a handheld video camera) both were captured simultaneously to ensure that the sunlight and shadows across the site remained consistent as the camera moves from the sky to the ground.

Kite aerial photography offers a dynamic perspective on the site as it operates in the zone between the photographic boom or tower, and the low flying aircraft. From the oblique angle chosen for this shot, the features within Skara Brae are separated out whilst remaining recognisable, helping the viewer to orientate themselves and establishing the site within its immediate and present-day landscape. There is also a dichotomy accompanying this aerial imagery, which can at once appear familiar and estranged. In contrast to the elevated view from the sea cliffs, this suspended view departs from the experience available to fieldworkers, visitors, or people in the past. In this respect it represents a disembodied perspective as the abstraction of the view shows things known rather than things usually seen.

### **5.2.6.3 Boundaries**

*Having descended to the ground, the camera now moves through the doorway of Hut 1 into the darkened interior of Passage A. Daylight reveals where the roof of the passage is missing, but the scene briefly appears to distort, revealing blurred faces and shadows. The camera then turns to focus upon a stone incised with abstract lines which are lit by flickering red firelight dancing across the surface. See Figure 5.13b.*

In this sequence, live action footage is mixed with computer generated shots of Neolithic art. These were generated on location using structure from motion photogrammetry, and lighting was added digitally in postproduction. The camera's trail through the passageway begins a journey within Skara Brae which (as preciously noted) has been explored by Richards (1991, 31). The inhabitant, or visitor, moves through a sequence of spatial divisions, punctuated at significant boundaries with incised decoration. Scratch art within the passageways has also been described by Shepherd (2000, 141) as 'muted' and 'secretive'. This implies that it was not solely decorative, but a focus for more subtle and symbolic meanings. The film references these possibilities by lingering upon the stone surface, while abstracted shapes evoke memories or visions. The significance and potency of crossing this point of transition is further acknowledged by the sudden shift from subdued daylight to flickering firelight.

### **5.2.6.4 Embodiment**

*The camera turns sharply and enters a low and foreboding passageway. Erratic movement reinforces the sense that we are now looking through the eyes of a protagonist. Hands reach out to guide through the darkness and the image distorts. A dim red light is seen ahead and a hearth is revealed, illuminating a junction of passageways and a narrow doorway. This sequence was filmed in Passage B using hand-held video, with visual effects added in post-production. The final few meters have collapsed and are now open to the sky, so live action footage merges into an entirely computer generated reconstruction of the passage network and hearth outside the entrance into Hut 7. See Figure 5.13b-c.*

Passage B is an uncomfortable and claustrophobic struggle to negotiate, requiring the visitor to crawl around a tight corner and down a slope. Shots of hands searching along the wall were included to directly capture the difficulties of restricted movement within this space, reinforcing the impression that the protagonist/audience are now situated firmly within the scene; that this is now an embodied experience. Rather than the camera emerging back into daylight where the roof is missing, the team wanted to retain this sense of place by digitally recreating the passage. Excavation has revealed that there was a hearth outside the doorway to Hut 7, and similar features have been found at other Neolithic settlements in Orkney such as Barnhouse (see Richards 2005). It is possible that fire possessed

a cleansing symbolism, and it reinforces a significant point of transition as the protagonist turns to enter Hut 7.

#### **5.2.6.5 Dwelling**

*The camera moves through a narrow entrance, revealing a room that is dimly visible through the smoky atmosphere. There is a central hearth beyond which a figure is seated in front of a stone-built 'dresser'. The camera moves cautiously forwards, glancing at other features nearby: stone furniture, pottery, drying fish, stone tools and a cow skull. One surface is covered with art, the deep scratches seeming to move and shimmer in the flickering light. As the camera draws near, these incised lines are unexpectedly revealed in bright colour. See Figure 5.13c.*

In this scene the interior of Hut 7 is a computer generated model created from the laser scan mesh and texture data. Reconstructed elements were then digitally modelled, including the speculative architecture of the roof, artefacts, a costumed character, lighting and atmospheres. The camera moves were prepared while filming within Hut 7, drawing upon the fieldwork to inform how the sequence would later be developed within the virtual model. The shot of the incised art combines sequences of animated photogrammetry captured in the field and draped with a painted image.

In this sequence it was essential to retain the sense of first-hand experience following the journey down Passage B. Furthermore, the team wanted to convey a sense that this was an inhabited dwelling, while simultaneously reflecting evidence which suggests Hut 7 was treated differently to other 'households' in the village. It is spatially separated by the uncomfortable crawl down Passage B and two female burials were placed under the right hand bed when the foundations of the structure were laid. It also appears to be the only structure which has a door that can be locked from the outside (Richards 1991, 31). These unusual qualities inspired representation of this space in the film as a convergence of domestic and ritual. The camera is hesitant, the intent being to suggest unfamiliarity or caution on the part of the protagonist. Similarly, the unexpected appearance of shifting imagery and colour aimed to convey further ambiguity and strangeness. Bradley (2009, 52) has suggested these stones may have been decorated with pigment in order to enhance the carved patterns; Watson's vivid abstraction serves as a reimagining of this evidence through the eyes of a present-day artist.

#### **5.2.6.6 Transformation**

*Following an encounter with brightly coloured art, the camera becomes increasingly unsteady and the interior of Hut 7 begins to blur and distort. Emerging from a collage of shifting light, we see that the seated figure's skin is intensely decorated with geometric designs. A carved stone ball turns slowly in her hands as facets upon its intricately carved surface catch the light. In slow motion, as if in a dream or*

*altered state of consciousness, this compelling stone object is then given to the protagonist. See Figure 5.13d-e.*

This sequence is entirely composed of live action footage recorded within Hut 7, with effects added later in post-production and combined with off-site footage featuring a replica of one of the carved stone balls discovered at the site. Inspiration for the body painting was derived from rock art motifs including the Pierowall stone in Orkney, and decoration on Grooved Ware pottery.

The disoriented experiences of the protagonist as they approach the mysterious seated figure are suggestive of an altered state of consciousness. It was also informed by the team's own experiences of working for long periods within the dark and confined spaces of Skara Brae. The narrative arc of the film is driven by a convergence of evidence from the archaeological record and the team's own sensory engagement as field workers; from the virtual to the actual, and from the sky to the underground. The journey begins with the disembodied perspective of flight, and ends with a direct encounter with an imagined person; from the wider landscape right down to a single artefact.

### **5.2.7 Workflow**

The workflow to this fieldwork (outlined in Figure 5.14) looked very different to the previous case study as it employed creative and reflexive practices. Compared to the St Kilda project, this workflow is much more complex and deviates from a linear design. Though a linear pipeline is at its core, the Skara Brae workflow frequently departs in offshoots from the more systematic processes of data collection.

In their 2010 session entitled *An Artful Integration? Possible futures for archaeology and creative work* at the Theoretical Archaeology Group conference in Bristol, Mhairi Maxwell and Pat Hadley asked whether 'artful integration' in archaeology should be considered as its own discipline, or if its strength lies in the un-disciplining of more conventional means of interpretation. Undoubtedly digital survey, in this case laser scanning and photogrammetry, provided an excellent basis for visualisation upon which additional techniques and approaches could be layered. However, those methodologies which embrace a more engaging embodied perspective allow the practitioner to take time to establish the site within the wider landscape and to appreciate aspects of the site not represented through survey: acoustics, texture, the experience of moving through the space. Adoption of a more involved way of recording the site at Skara Brae gave the team time to linger, observe and interpret.

This sense of exploration can lead to interpretative innovation by deviating from the usual linear constraints of conventional method into an embodiment of what abstract artist Joan Mitchell has famously termed 'messy thinking' (Cajori 1992).





The advantage of 'artful integration' in archaeology then is not necessarily in an ability to collapse or reinvent conventional processes. Instead, its power lies in its willingness to negotiate a complementary partnership between the subjective and objective methods and perspectives of the site and to facilitate a practice-based methodology of thinking through doing. It is rare for research schedules and conventional methodologies to encourage archaeologists and surveyors to step away from their scanners, cameras and other recording devices, and simply dwell. As a creative method, the collection of mixed-media as part of this project allowed convergence of empirical techniques directly alongside subjective and sensory experiences. Crucially, it offers a means by which to inhabit and interpret the otherwise passive data gathered by cameras and scanners and reanimate this alongside embodied encounters with sites and landscapes.

With the accuracy of laser scanning held in such high regard, preservation of data integrity is of upmost priority in any research-driven methodology. However, once the linear process of data acquisition and observation expands into the investigation of human sense and experience, conventional quantification as part of the workflow becomes increasingly complex and problematic. A creative manner of working does not make the process impossible to interpret, instead it stresses that the meaning of the visualisation process and by association the interpretive process on a project of this nature must be found in its context. At Skara Brae, basing the field method around an interpretive narrative meant that the team were constantly considering a multitude of stages across what can be termed a conventional 'pipeline' method of working. Much like Heidegger's hermeneutic cycle, the process of interpreting a site in order to visualise it as a whole is established by referring between individual parts of this pipeline. Research and fieldwork which integrates more embodied and creative approaches to the interpretation of archaeological sites will consequently be subject to multiple variables which will result in the cognitive process being different every time.

### **5.2.8 Creation Summary**

This case study explored mixed-media as an archaeological field method through the act of making an experimental film, incorporating digital survey data and creative practice in a single approach. As was demonstrated, a mixed-media approach has the potential to capture and communicate very different qualities of the archaeological record to systematic and objective techniques of data collection alone. The process of gathering and converging diverse media, from laser scans to watercolour painting, began to make space for experiential and creative responses to the past to develop.

Field archaeologists primarily engage with the archaeological record through their senses, though these experiences are frequently mediated by technologies such as cameras, survey machines or scanners. As was demonstrated through the St Kilda pilot study this muted engagement can influence and constrain

the kinds of information that are observed and recorded, effectively distancing the field worker from their material. Photography for example fixes an image and frames the world through a viewfinder, giving the impression of time being frozen. Similarly, automated three-dimensional meshing techniques such as laser scanning capture surfaces in enormous systematic detail but at the expense of embodied human engagement and interaction. There are no defined archaeological methods or machines for capturing or reproducing ephemeral sensory qualities such as sound, or the impact of time and movement upon how places and landscapes are understood. In light of this, the Skara Brae case study represented an alternative field method whereby established methodologies were integrated with more creative and subjective approaches which have the potential to foreground embodied sensory experience.

Development of a supplementary interpretive narrative at Skara Brae facilitated a means by which the practitioners could expand their engagement with the site outwith the conventional constraints of digital survey as they begin to develop an understanding of the site which attempted to move beyond modern preconceptions of Neolithic life. Each practitioner's self-awareness and reflexivity was enhanced by working in a collaborative environment as observation and involvement with the methods and ways of thinking employed by the others allowed much deeper reflection on each individual method and technique. Post-processual archaeological method asks for this level of reflexivity and subjective engagement, yet with the inception of more automated digital survey methods archaeologists often lose sight of this fundamental theoretical discourse. Each individual contribution to the film could confidently be exhibited separately as each approach offers a unique insight into interpretation of the site, be that scientific and objective or creative, experiential and subjective. However, when these approaches are brought together around a central narrative the result is a more honest, enriched, deeper and visually challenging view of this site and its contextual landscape.

The case study opened a dialogue between archaeologists and heritage professionals regarding the value and integration of more creative and embodied methodologies into archaeological practice, considering issues surrounding engagement, experience and integrity. The following section will explore these themes further by inviting the public to engage with this dialogue by means of a series of exhibitions across a range of venues.

### **5.3 Exhibiting the Work**

"The power of representation lies with few, yet the subjective response is owned by many."

Waterton and Watson (2010, 4)

The film and accompanying exhibition was shown in a variety of contexts between 2012 and 2013 (see Figure 5.15 and Figure 5.16). The format for presentation varied dependent on venue. For example, in December 2012 the film was exhibited in the foyer of the Gregory Building at the University of Glasgow for one week following an introductory talk by the author. Although adjacent to the archaeology department the audience included students from a range of disciplines. The film was played on a constant loop and an accompanying display board exhibited a series of stills from the film, images of data and photographs from the fieldwork together with written captions detailing the process and intended outcome of the project. During January 2013 the film was shown as part of an archaeology department seminar presentation at the University of York (also live streamed to the Archaeological Computing Research Group at the University of Southampton) followed by a Q&A session. The version of the film shown at both of these events was prior to the soundtrack being added. From May to August 2013 the film and exhibition were installed in the old ticket office at Skara Brae; this edit of the film included the ambient soundtrack composed especially for the film by Dr John Was. Feedback from questionnaires was collected from all three venues.

In addition to these instances, the film was also shown from June to August 2013 as part of the Jim Pattison *Models of Mind* exhibition at the Pier Arts Centre in Stromness, Orkney. Pattison's work represented a continuation of the art and archaeology theme at the Pier Arts Centre, with this particular exhibition focussing on the Neolithic carved stone balls of Scotland, including works which related to the specific artefact used in the final sequence of the *Digital Dwelling at Skara Brae* film. The film was shown in a gallery at the top of the building accompanied by Pattison's Skara Brae artwork. The gallery was a very different context to the locations the film had been previously shown in and the team felt confident in letting the film stand by itself as an art piece without the accompanying *Digital Dwelling* exhibition. However, if visitors to the arts centre did wish to know more about the work a coffee-table book was presented adjacent to the screen which held the narrative and select images from the exhibition; this volume is incorporated within the portfolio accompanying this thesis. It was not felt appropriate to collect questionnaires from this venue and as such only verbal feedback was obtainable.

### **5.3.1 Compiling the Exhibition Content**

As mentioned above, the exhibition content included a series of film stills and photographs together with descriptive captions detailing the aims of the project, the techniques used and the reflexive fieldwork process. This layout was intended to give the viewer a sense of the process behind the creation of the work, and to stress that much of the value of interpretive visualisation lies in its creation, not solely with the final outcome.



Image © Baxter 2012

# Digital Dwelling at Skara Brae

DIGITAL  
DESIGN STUDIO  
THE GLASGOW  
SCHOOL OF ART

SCOTTISH TEN

HISTORIC SCOTLAND  
ALBA AOSMHOR

a collaborative project in archaeological visualisation

Exhibition opens **Saturday 25<sup>th</sup> May 2013**  
in the Old Ticket Office, onsite at Skara Brae

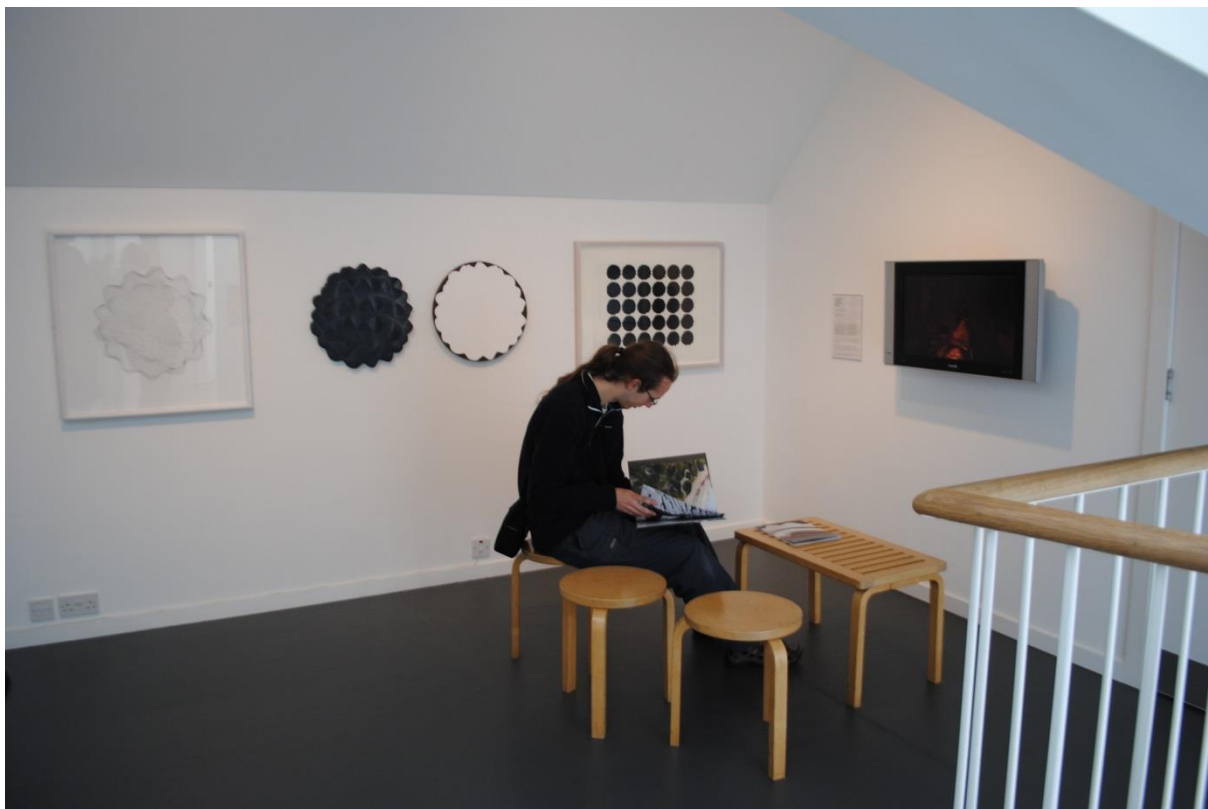
Introductory talk by  
Alice Watterson, Aaron Watson  
& Kieran Baxter

**5pm Friday 24<sup>th</sup> May**

Lecture theatre  
Orkney College UHI, Kirkwall

Image © Watterson 2012

Figure 5.15: A poster for some of the *Digital Dwelling* events during summer 2013.



**Figure 5.16:** Top: The *Digital Dwelling* exhibition onsite at Skara Brae and bottom: the film being shown in the Pier Arts Centre in Stromness as part of Jim Pattison's *Models of Mind* exhibition (author).

In explaining why certain creative decisions were made it was hoped that the visitor would gain an appreciation for the levels of uncertainty involved in archaeological visualisation, challenging any preconceptions that a reconstruction is a definitive answer and that it can, or should, show everything.

Key themes were identified within the film and used to structure the exhibition content. These themes were as follows:

- Picturing the past in the present
- Layered media
- Perspectives

‘Picturing the past in the present’ related to these issues of preconceptions on the part of the audience as to what was expected of interpretive imagery. For example, the exhibition maintained that the Skara Brae film was not a ‘reconstruction’ as this term carries with it an implication that it is possible to see through the eyes of Neolithic people. Instead, it is a reflection of the experience and interpretation involved in the visualisation process, a story about the practitioner’s own engagement with the archaeological record at Skara Brae. It portrays the past only as it is experienced in the present: unfamiliar, emotive, dynamic and transformative. The use of ‘layered media’ within the film was mirrored in the exhibition content and outlined within the captions. Closely related to this was the theme of ‘perspectives’ which was played out as the film’s journey developed from a somewhat disembodied aerial perspective, to a far more embodied experience down within the walls of the village towards an encounter with a person and an artefact at the film’s conclusion. The film was intended to be viewed alongside the exhibition and as such a conscious decision was taken not to provide a subtitled or spoken narrative as part of the film itself as it may have distracted and explicitly influenced the viewer’s engagement with the audio visual material.

### **5.3.2 Questionnaires**

A key aim of the Skara Brae film and exhibition was to challenge the passive consumption of interpretive visualisation in archaeology by encouraging the audience to actively engage with interpretation. The film pushed the boundaries of what is usually offered by means of interpretation at heritage sites by developing a subjective interpretive narrative based around current interpretation, while the accompanying exhibition offered the visitor some fundamental concepts from which they could begin to develop their own critical understanding of the project. The short feedback questionnaires included a series of questions to gauge how successful the film had been in achieving its aims in a variety of contexts. The first question on the form, “*How much prior knowledge do you have about Skara Brae and the Neolithic period in Orkney?*” was rated on a scale of 1-5, one being “*None at all*” and five being “*A*



*good understanding*". This question was intended to assess how familiar the individual was with the site and place the following questions in a context ranging from, for example, a day visitor to the site, someone with prior general interest and an archaeological expert.

The next question, *"How do you feel the film helped broaden your understanding and experience of the site as a whole?"* was again rated between 1-5, one being *"Not at all"* and five being *"I learned something new"*. This question was intended to establish whether the viewer felt their experience of the site (or their remote understanding of the site, in the case of the Glasgow Archaeology Department exhibition and York seminar) had been enhanced and complemented by the film.

The questionnaire then asked the visitor, *"As the film progressed at what point did you become aware of its increasingly subjective interpretation?"* and listed three possible responses:

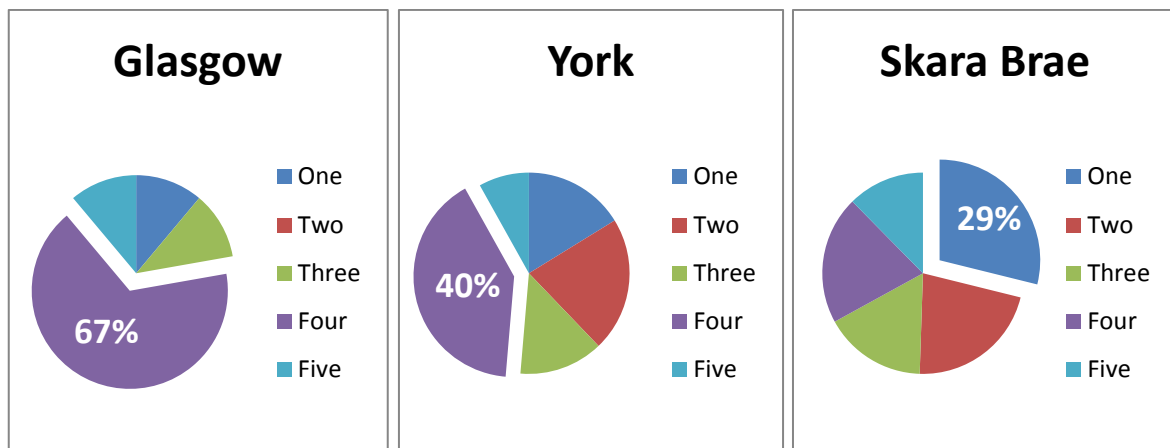
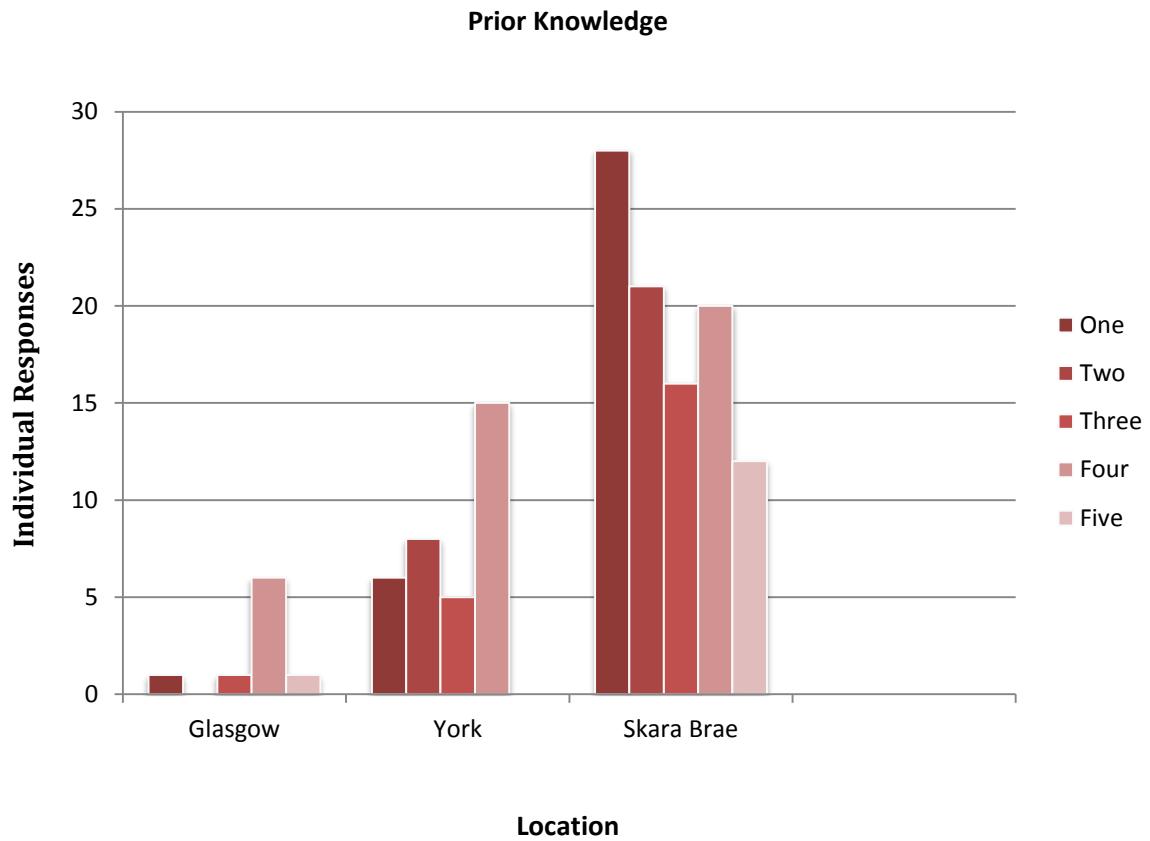
*"I began watching the film with a critical awareness which I maintained throughout"*

*"As the film progressed I became aware of the interpretation becoming more creative"*

*"I hadn't considered subjectivity at all until now"*

The final question asked the visitor whether they preferred the mixed-media film, or the static images within the exhibition, again rated on a scale of 1-5. An optional *"Additional comments"* box was also provided. Of the different locations feedback was collected from, Glasgow provided a sample of nine, York a sample of thirty seven and Skara Brae a larger sample of ninety seven questionnaires.

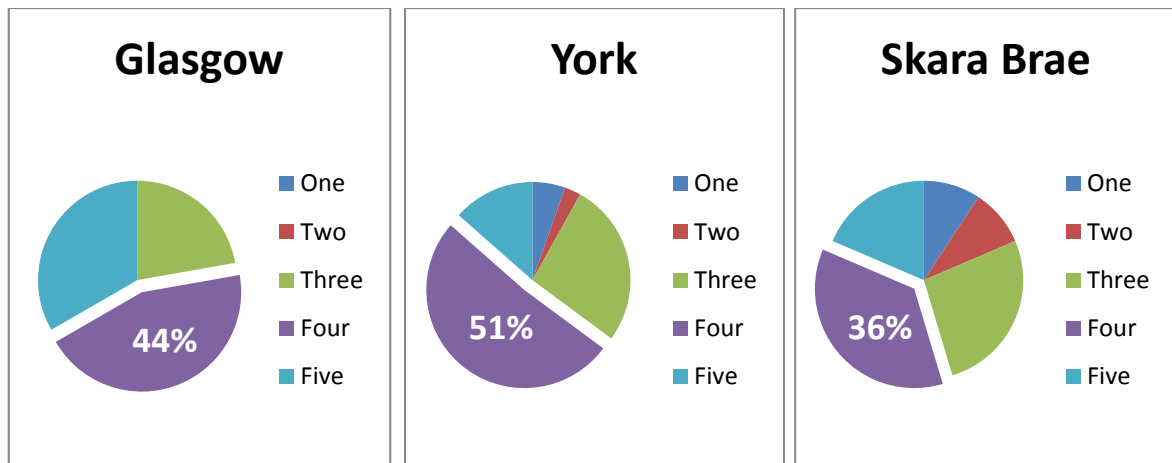
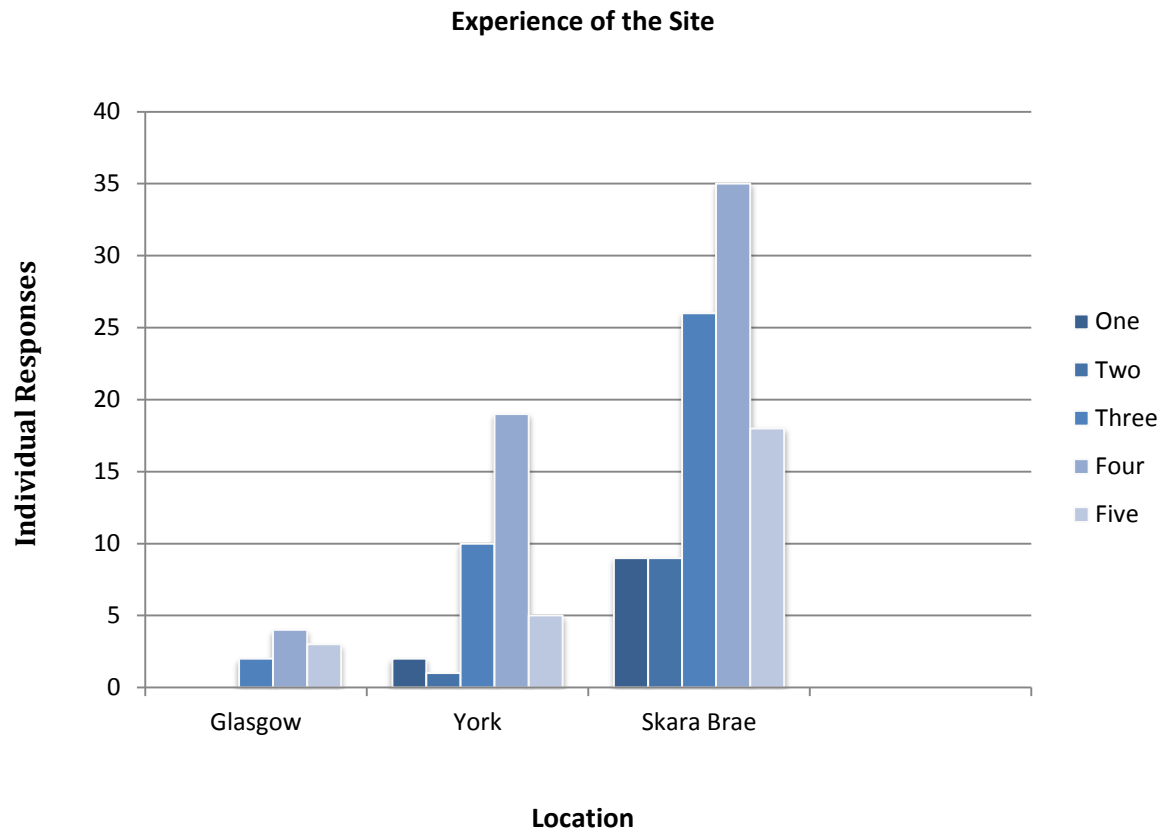
The results from the questionnaires were compiled into a database (a spreadsheet from which can be found in the accompanying folio) then translated into the following graphs and charts (Figure 5.17 to Figure 5.20).



How much prior knowledge do you have about Skara Brae and the Neolithic period in Orkney?

None at all    **1**    ○    ○    ○    ○    ○    **5**    A good understanding

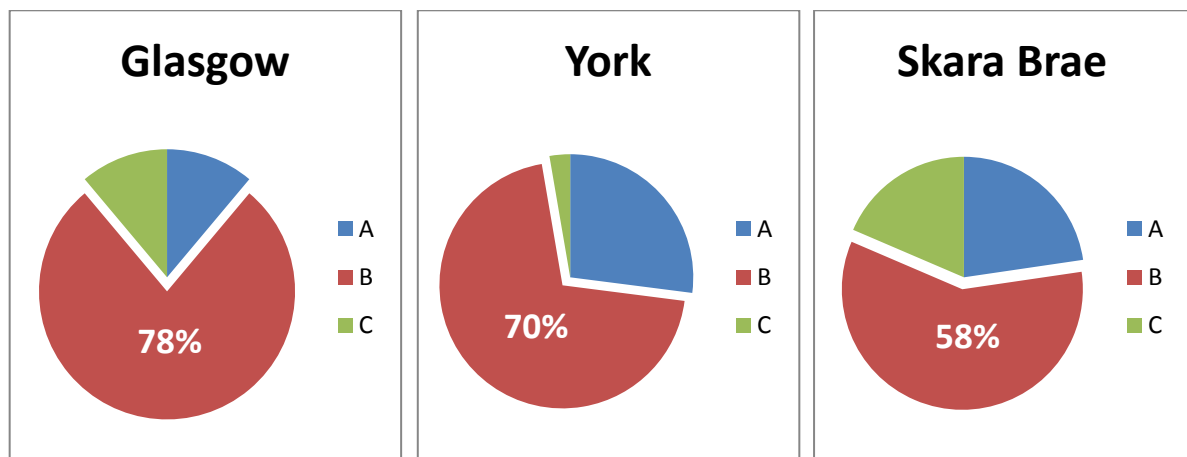
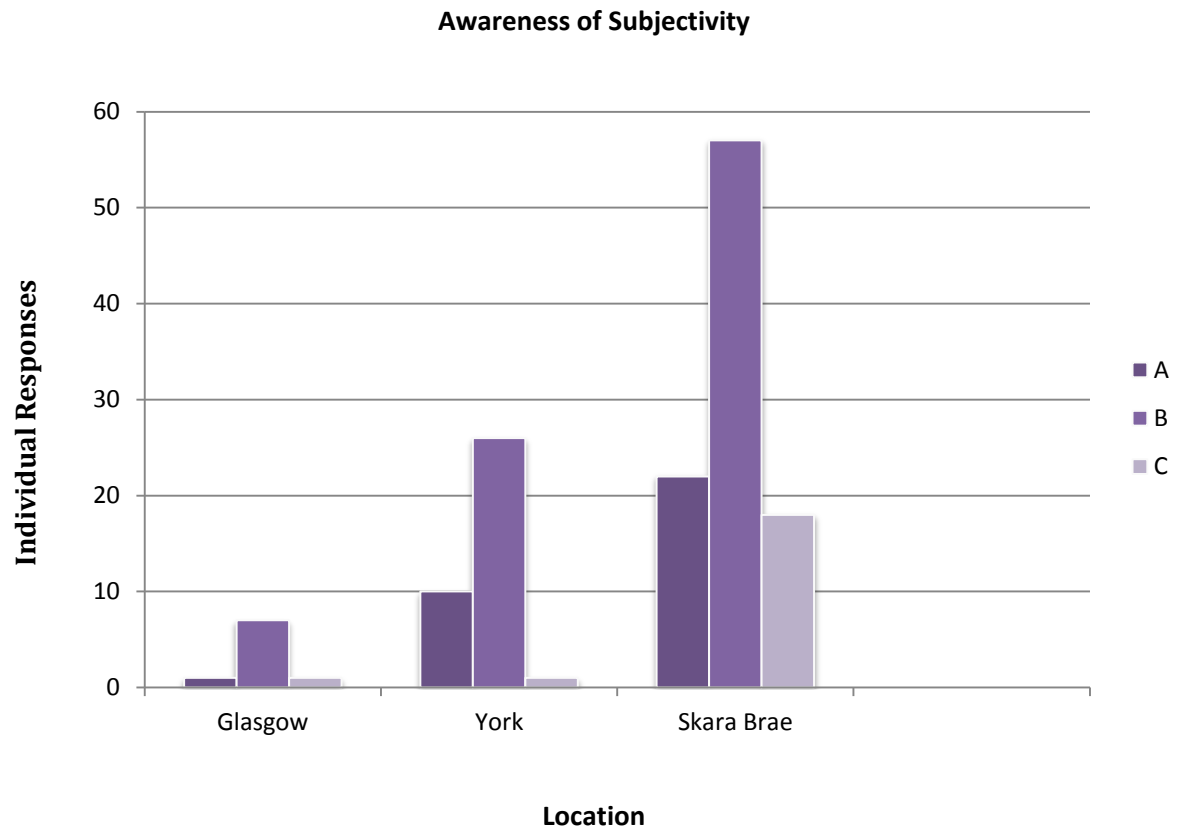
**Figure 5.17:** Charts detailing the level of prior knowledge about the site, one being none at all, five being a good understanding.



How do you feel the film helped broaden your understanding and experience of the site as a whole?

Not at all      1      ○      ○      ○      ○      ○      5      I learned something new

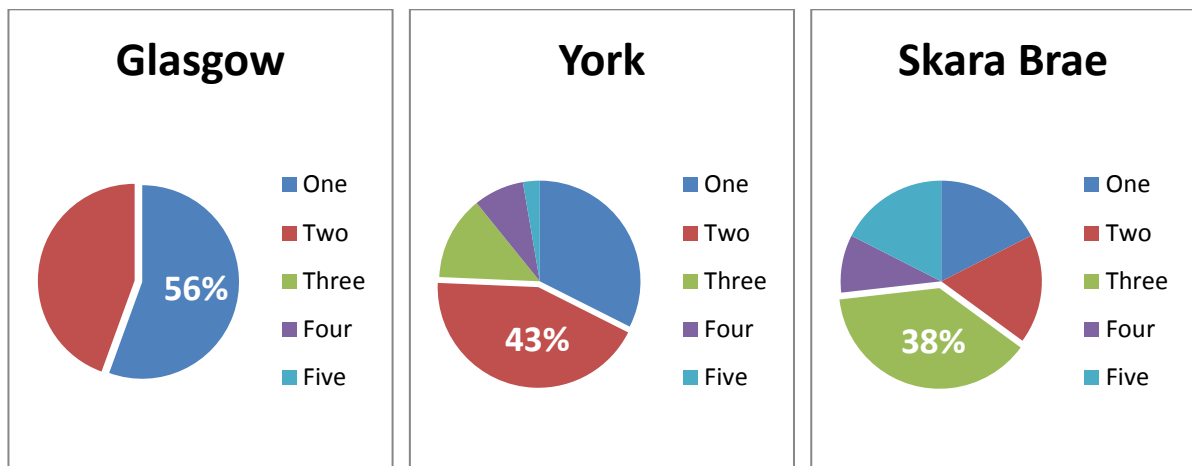
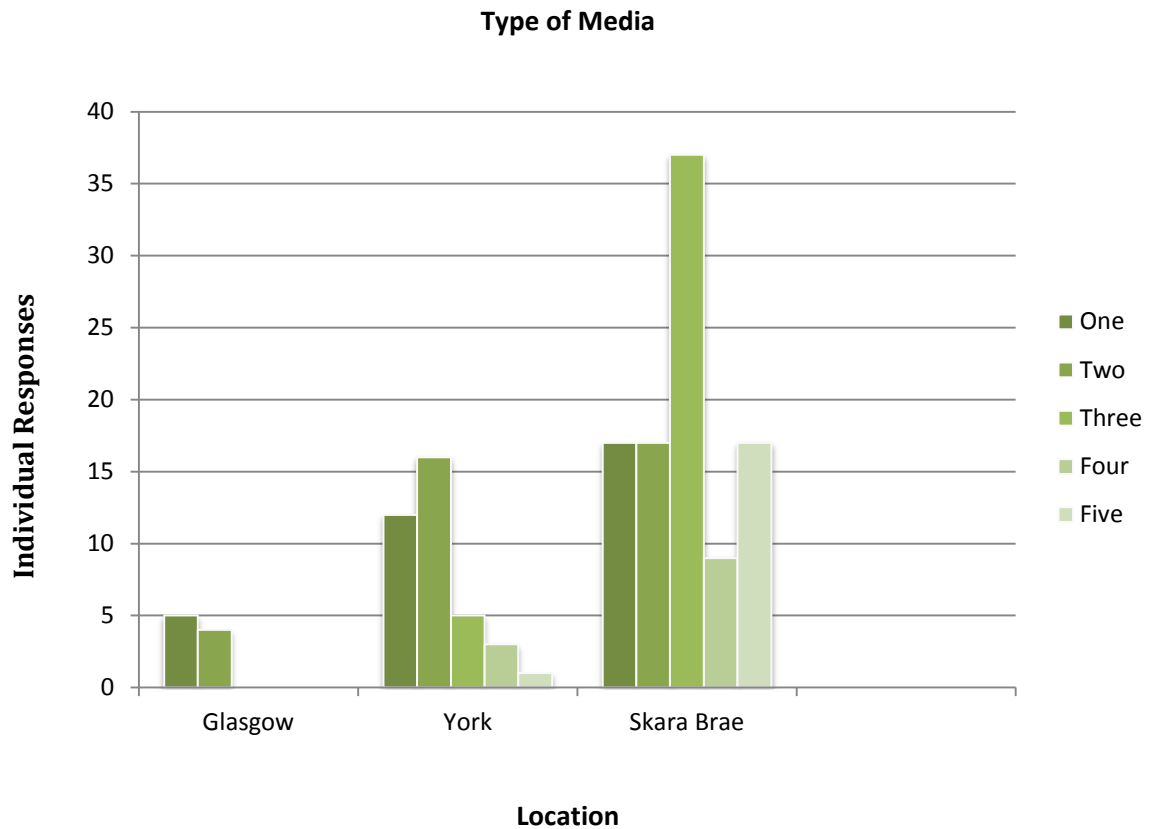
**Figure 5.18:** The charts detail whether the audience felt they learned something new, one being nothing new, five being something new.



As the film progressed at what point did you become aware of its increasingly subjective interpretation?

- ☐ I began watching the film with a critical awareness which I maintained throughout
- ☐ As the film progressed I became aware of the interpretation becoming more creative
- ☐ I hadn't considered subjectivity at all until now

**Figure 5.19:** The charts detail at what point the audience became aware of subjectivity, 'A' being right away, 'B' being as the film progressed and 'C' being not at all.



Having viewed the film and the stills in the talk and exhibition which medium of presentation did you prefer?

*Mixed media film*    **1**    ○    ○    ○    ○    ○    **5**    *Static images alone*

**Figure 5.20:** The charts detail on a scale of one to five which medium the audience preferred, one being mixed-media, five being still images.



### 5.3.3 Feedback

Broadly speaking, the feedback from each venue was largely positive and encouraging, where critical feedback occurred on the whole it was constructive. In the mostly academic contexts of Glasgow and York the film received responses which reflected a genuine excitement and interest in the film and the aims of the project, while onsite at Skara Brae the film received positive comment in terms of enjoyment and interest, where negative comment occurred interestingly it seemed to incur an almost angry response to this particular representation of the site.

As can be observed in the graphs and charts (Figure 5.17 to Figure 5.20), results varied between the audiences which were mostly divided between the academics in Glasgow and York and a largely general public audience at Skara Brae, as demonstrated by the 'Prior Knowledge' graph. On the whole in each instance a majority percentage felt they had learned something new from watching the film; those who scored this question at four or five commented that the film complemented or enhanced their appreciation for the site. Those who did not feel they gained anything positive from the film took issue with the media used; for example, one commenter believed that the film was "artistically indulgent" (record no. 118, Skara Brae), another commenting that it was "a bit too arty" (record no. 66, Skara Brae). In terms of the audiences' awareness of the subjectivity of the film the majority answered B - *As the film progressed I became aware of the interpretation becoming more creative*. The next most common was A - *I began watching the film with a critical awareness which I maintained throughout*. While only two people in York and Glasgow answered C - *I hadn't considered subjectivity at all until now*. At Skara Brae a much larger proportion of the audience had overlooked subjectivity completely until they were prompted to consider it while answering the questionnaire. Generally speaking, within the academic audiences at Glasgow and York, the majority preferred the mixed-media film approach, while at Skara Brae the audience was more divided, the majority choosing a neutral response in the middle.

Although not every individual who filled out a questionnaire chose to leave a comment, those that did begin to shed light on the trends visible in the responses across the three locations. Given that the film was shown at both Glasgow and York as a work in progress and prior to the soundtrack being developed the feedback reflects a feeling of constructive criticism and positivity. A number of the comments suggested alternate views of the site or mentioned an element they felt had been overlooked.

"Single reconstruction of interior and woman by fire - could do with 'alternatives.'"

(Record no. 2, Glasgow Archaeology Department)

"(I am) still not sure why at some point we do not see Skara Brae situated inland from the coast."

(Record no. 6, Glasgow Archaeology Department)

“Perhaps a little too orientated toward the ritual - what was the rest of the site used for? How was it used?”

(Record no. 16, York seminar)

Collectively, these comments indicate that a proportion of people approach an interpretive visualisation with some level of preconceived expectation over what an archaeological reconstruction or visualisation *should* do and how it *should* be represented. It appears there is an expectation, particularly on the part of the academic audience, that a visualisation should show all aspects of a site together with alternate possibilities within a single representation. This seems to stem from a perceived need on the part of the expert to emphasise a level of uncertainty to the audience in the sense that a single interpretation is never absolute. This attitude implies that the visualisation should provide opportunity for representation of alternate pasts in order to emphasise interpretive uncertainty. The issue with this is that it places all interpretive responsibility on the visualisation itself, absolving an audience of any need for critical awareness when consuming these images. Conversely however it does highlight the limitations of a fixed linear narrative.

Onsite at Skara Brae certain comments gave an impression that a number of visitors from the sample had approached the film with a very clear preconceived impression of how they imagined Skara Brae in their minds.

“Music made it seem 'other worldly' - but the wonder of Skara Brae - unlike other sites (pyramids etc.) - is its humanity, people like us lived there.”

(Record no. 64, Skara Brae)

“Sorry the film is NOT peaceful enough for such a beautiful place.”

(Record no. 139, Skara Brae)

The audience at Skara Brae seemed divided in their willingness to accept alternate interpretations or impressions of the site, while others seemed to accept the interpretation without question.

“Fascinating insight into my heritage.”

(Record no.48, Skara Brae)

“Excellent progress into past centuries. Brought very clear to us today. Most educational into our history.”

(Record no. 121, Skara Brae)

However, reassuringly a number of visitors seemed to have consumed the film as an additional interpretation to complement what they already knew about the site, or had already consumed during their journey around the visitor centre prior to reaching the *Digital Dwelling* exhibition. However, this apparent heightened understanding may simply reflect that these individuals paid particular attention to the accompanying exhibition while others only glanced at it.

“Always good to see sites and information like this being monitored so it engages future audiences.”

(Record no. 50, Skara Brae)

“Second time to visit here and learned something new! And the film is very creative!”

(Record no. 60, Skara Brae)

“I am impressed by the approach that, while we know a lot about the physical remains/artefacts, there are still many questions unanswered - many perhaps that will remain unanswerable however much we dig and examine - different answers by different people for different reasons.”

(Record no. 109, Skara Brae)

To formulate a clearer understanding of these mixed responses it is useful to consider how a visitor presently experiences interpretation onsite at Skara Brae. Prior to reaching the site itself, the audience start their Skara Brae journey in the visitor centre exhibition which begins with an introductory film explaining the discovery of the site and some of the artefacts, then the visitor progresses through a small exhibition of cased artefacts with basic descriptions. Before making the walk down to the site the visitor can explore a ‘replica hut’ which was built with the intention of providing the visitor with an experience of being down inside one of the huts (specifically Hut 7, the best preserved of the remaining structures), a vantage point which is not permitted on the site itself today. However, this ‘replica’ does not present an adequate representation of a number of the key architectural features of the village. For example, due to wheelchair access and health and safety requirements the visitor is able to walk upright down a concreted passageway into the structure, a vastly different experience to the scramble down Passage B and squeeze through the doorway to Hut 7 onsite. The echoing concrete floor continues into the artificially lit structure which has the effect of making the house seem sterile and un-lived in. This is a vastly different experience to the soft earth floor onsite and the experience of Hut 7 being lit only by natural light from the doorway or a hand-held light source. Furthermore, although the stones used in the replica have the correct aesthetic form, they are more uniformly coursed and fail to recreate the subtle

nuances of colour in the Hut 7 stones (soft reds and blues), instead appearing grey and dull. When visitors reach the site it is situated within a fenced in area with a manicured lawn and paved paths which guide people around the tops of the structures to peer down into the village below. Stewards are on hand to offer additional information about the village and its discovery, most drawing parallels with the layout, furniture and functionality of modern homes today.

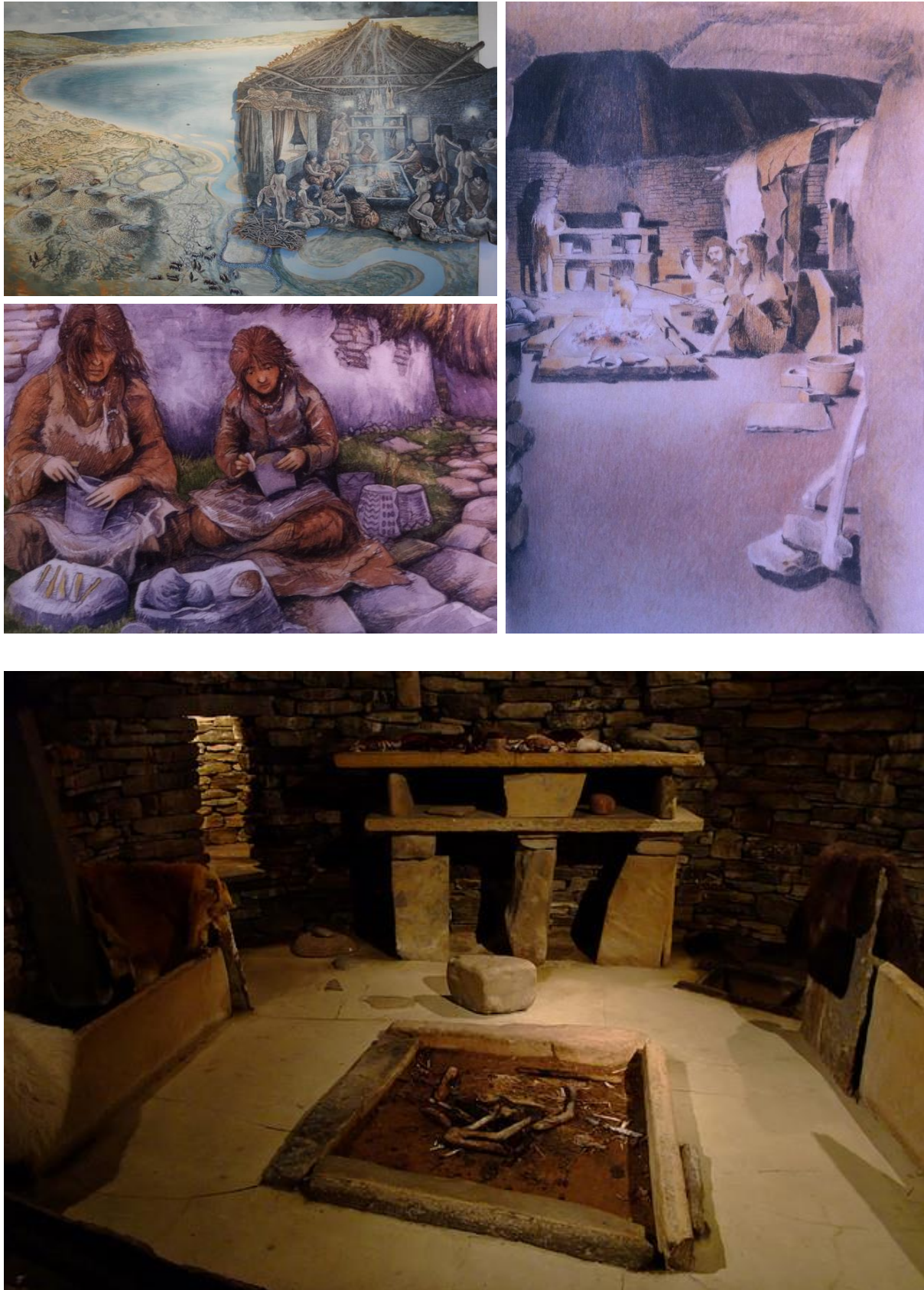
The resident visualisations presented across the site are typically traditional in their media and content (see Figure 5.21 for examples). They present a prehistoric parallel to a conventional nuclear family conveyed in watercolour sketches. The visualisations avoid the intangible side of the site, perpetuate gender roles and focus on the domestic, though some of the interpretive text in the guidebook not only suggests possibilities for alternative interpretations, but states that although most interpretations favour a domestic farming community, “the evidence is far from conclusive” (Clarke 2012, 32-33). The guidebook then goes on to describe ‘religious’ interpretive possibilities suggested by the layout, decoration and artefacts present within the village, concluding that it is most likely that village life conformed to a combination of these possibilities. In Chapter 2 Turkle’s (2009, 7) assertion that a digital simulation carries with it an aesthetic seduction which can make itself ‘easy to love and difficult to doubt’ was considered. However, having reviewed the feedback from the site it would seem that critical awareness of the uncertainty involved in archaeological interpretation lies not with the media used to portray the interpretation, but with the context it is displayed within and its content.

How can interpretive visualisation begin to successfully represent the more intangible side of heritage to an audience who is often accustomed to a legacy of typically muted representations? The *Digital Dwelling* film experimented with interpretation of the more intangible side of the archaeological record for the site and did so using a variety of creative techniques. Feedback would suggest that the majority of audiences either approached the film with a critical eye, or became aware of the subjective nature of the interpretation as the film developed into use of abstracted visual techniques and media to represent detachment from our modern day perception of ritual and convey the strangeness of this imagined experience.

Many of the comments picked up on this and though they were perhaps intended to be negative, they reflect that this intention of the film was successful to some extent in this respect (see Figure 5.22).

“There was no film narrative and it jumped about a lot, it felt a bit like watching a horror movie!”

(Record no. 85, Skara Brae)



**Figure 5.21:** Reconstructions of life at Skara Brae currently on display onsite, including a photograph of replica Hut 7 (photographs by author).



"Interesting but parts of the film (blurred) were hard to watch (slightly nauseating) but understood the "transformation" aspect."

(Record no. 88, Skara Brae)

"The fading out of focus effects in the film are just confusing."

(Record no. 106, Skara Brae)

"I found the film confusing and disorientating."

(Record no. 128, Skara Brae)

"I get what you are trying to do but felt a bit weirded out by the film."

(Record no. 138, Skara Brae)

"Having been lucky enough to enter House 7 myself I would say that of all the representations I've seen this project comes closest to portraying the "other worldliness" and peculiarity of the sensory experience of venturing down the claustrophobic passages and entering the structure - very well done!"

(Record no. 142, Skara Brae)

As previously discussed the film was not produced to stand alone, but was intended to be displayed alongside the exhibition which described the project aims, creative intentions and a little of the fieldwork process. With regard to media used there seems to be a need to represent interpretive content in a familiar format and much of the feedback reflected a need for subtitles or spoken description.

"Some sort of subtitle would help. [*Sic*] Foreigners, even though I knew there's no conversation. For example, descriptions of what's going on would help."

(Record no. 59, Skara Brae)

"Informational video would have been better."

(Record no. 97, Skara Brae)

"Artistically indulgent, some (a few even!) well-chosen words would have been good."

(Record no. 118, Skara Brae)



**Figure 5.22:** A parody movie poster designed for a post on the author's research blog (Watterson 2014). The poster was intended to highlight that the negative comments are often the most revealing and was accompanied by a discussion of the *Digital Dwelling* feedback.

These collective responses were interesting in that they seem to be location specific. Although no formal feedback forms were collected from the Pier Arts Centre *Models of Mind* exhibition, having observed visitors watching the film in the art gallery and discussed the film with a number of guests during the opening event, nobody asked for any explanation. Instead, people seemed much more content to interpret what they saw for themselves. In fact many guests approached members of the team to discuss *their own* interpretations of what the film portrayed to them personally. The audiences throughout the evening seemed very engaged with the film, and though few picked up the accompanying descriptive book to read about the creative intentions of the project, most were eager to form their own interpretations without additional narrative.

#### **5.3.4 Consumption Summary**

Having considered the feedback from each location in detail a number of conclusions can be drawn from the results. On the whole the academic community has been very receptive to the objectives outlined by the *Digital Dwelling* project and test audiences have enthusiastically engaged with the material. However, with regard to the more general audience onsite at Skara Brae the results were mixed. In a number of cases the general public seemed to want to view these images as a conclusive answer, rather than an interpretation. Consideration of the feedback comments seems to suggest that these issues stem from the way traditional archaeological visualisations are currently consumed within these contexts.

The intention of the *Digital Dwelling* film was to engage people more readily with the more intangible side of archaeological interpretation and to challenge the passive consumption of the ‘archaeological reconstruction’ by using a palette of approaches and techniques to represent the site and current interpretations. The film and exhibition were not intended to replace existing visualisations, but to complement the interpretive content which was already available. Feedback indicates that with this particular film and exhibition the audience was divided in this respect. Some immediately engaged with the material in the exhibition and film, understanding the intentions and consuming the media with critical awareness and cognitive engagement. Others seemed to have difficulty in overcoming the initial deviation from a format they were familiar with and the ‘fixed’ interpretation they already carried with them about the site. A few even took the film to be a ‘truth’ about the site, as opposed to an informed interpretation. As noted earlier, this may be representative of the number of visitors who watched the film but ignored or only glanced at the exhibition.

In order to address this feedback and move towards a sustainable solution it seems there is need for the general public’s current perception of visualisation to evolve towards being recognised for its interpretive capabilities, not as a definitive answer. *Digital Dwelling* provided a case study driven by a collaborative process and practitioner engagement with the site during fieldwork, as such there was

limited consideration of audience. As a consequence of this many audience members had difficulty interpreting the film without the narrative provided by the accompanying exhibition.

## **5.4 Summary**

This chapter documented the development of the case studies from observation and analysis of the data collection phase of the visualisation process on St Kilda, to a collaborative project at Skara Brae which culminated in a series of exhibitions in both academic and public contexts. The following chapter will evaluate and discuss the case study findings and their implications for the field of archaeological visualisation. Furthermore, a developing project at the Links of Noltland on Westray will provide an outline to future work by beginning to consider audience and consumption as a more active reflexive part of the fieldwork process, allowing more room for the final outcome to be shaped by the context it will be shown in.

## 6 Discussion

Archaeology is a discipline rich in visual material with numerous applications for visualisation within the field such as illustration, reconstruction, photography, digital survey and artistic impressions. However, despite the apparent prominence of visual techniques in archaeology, fundamental issues with its application have remained problematic and largely unresolved. This research has, through the observation, exploration and collaboration of various techniques and approaches to visualising the archaeological record, sought to move the current debate forward. The research has raised and challenged a number of common preconceptions and assumptions associated with the concept of 'visualisation' or 'reconstruction', suggesting by means of practical demonstration the ways in which its role could be redefined within the field. A series of research questions were outlined from the outset:

- In what way is a practitioner's interpretive engagement with an archaeological site mediated by different data capture and visualisation methods in the field?
- How might practitioners of archaeological visualisation combine the creative and subjective methods of storytelling and visual expression with the more systematic and traditional means of data collection and visualisation to create dynamic and challenging imagery which promote cognition?
- How can we foreground and communicate the importance of the interpretive process involved in the creation of engaging visualisations to general audiences?

Investigation of these has shown that in the field of archaeological visualisation foregrounding the importance of process and engagement can result in the visual output being of far greater interpretive depth and validity as a research process in itself.

### 6.1 Review of the Findings

The initial research problems identified at the inception of this study concerned the production and consumption of archaeological visualisations. It was noted that digital techniques for archaeological three dimensional surveys and visualisation had been adopted into the field without adequate assessment of their impact on practitioner engagement. This was demonstrated through the St Kilda pilot study which took a reflexive approach to laser and photogrammetry survey of the settlement on the island of Hirte and concluded that practitioner engagement with the site in the field was muted by technology.

These problems were addressed by experimentation with practice based solutions in the Skara Brae case study which found that the layering of techniques, technologies and approaches of varying subjectivity



began to alleviate some of the issues. The Skara Brae fieldwork demonstrated that rather than being altogether incompatible with digital survey methods (see Whitley 1998 and Zubrow 2006), artistic and embodied methodologies could be successfully integrated into the visualisation workflow without the need for a complete break down or reinvention of established practices. In collecting and converging mixed-media the team were able to facilitate experiential and creative responses to the past alongside systematically collected survey and representations of landscape, structure and artefact evidence, thus negotiating a complementary partnership between subjective and objective perspectives of the site. Although observation of the workflow for this project showed that the more creative approaches did not necessarily follow the same systematic algorithms and quantifiable processes as the digital survey techniques, it also demonstrated their strength in revealing insightful interpretations of the evidence which would have otherwise been overlooked.

When it came to disseminating the work results varied across different contexts; academic and general audiences perceived the film and exhibition in their own way dependent on their prior understanding, expectations and preconceptions. A large proportion of visitors to the *Digital Dwelling* exhibition at Skara Brae came with specific expectations of what a visualisation *should* provide and how it *should* be presented. The findings from this case study served to illustrate that in a heritage context the prevailing attitude towards visualisations as being ‘answers’ rather than ‘interpretations’ means that single images are becoming ‘fixed’ in the minds of the visitors. It seems a typical visitor to the site is attuned to simply passively consuming information rather than engaging with the materials provided to actively establish a flexible interpretation of the site.

The field of archaeological interpretation and outreach needs to re-think the intention behind these visualisations by way of reflexively questioning what should be asked of an image. In order for this to influence the ways in which audiences consume this material in a heritage context the mechanisms used to present this material need to be addressed and further developed. The value of visualisation in an interpretive archaeological context lies in its ability to encapsulate and communicate ideas, theories and interpretive responses to the archaeological evidence, inspiring and developing discussion rather than presenting a definitive final conclusion on the site. Unfortunately it seems that in many cases it is this definitive conclusive answer that many visitors have (not unreasonably) come to expect.

## **6.2 Evaluation of the Results**

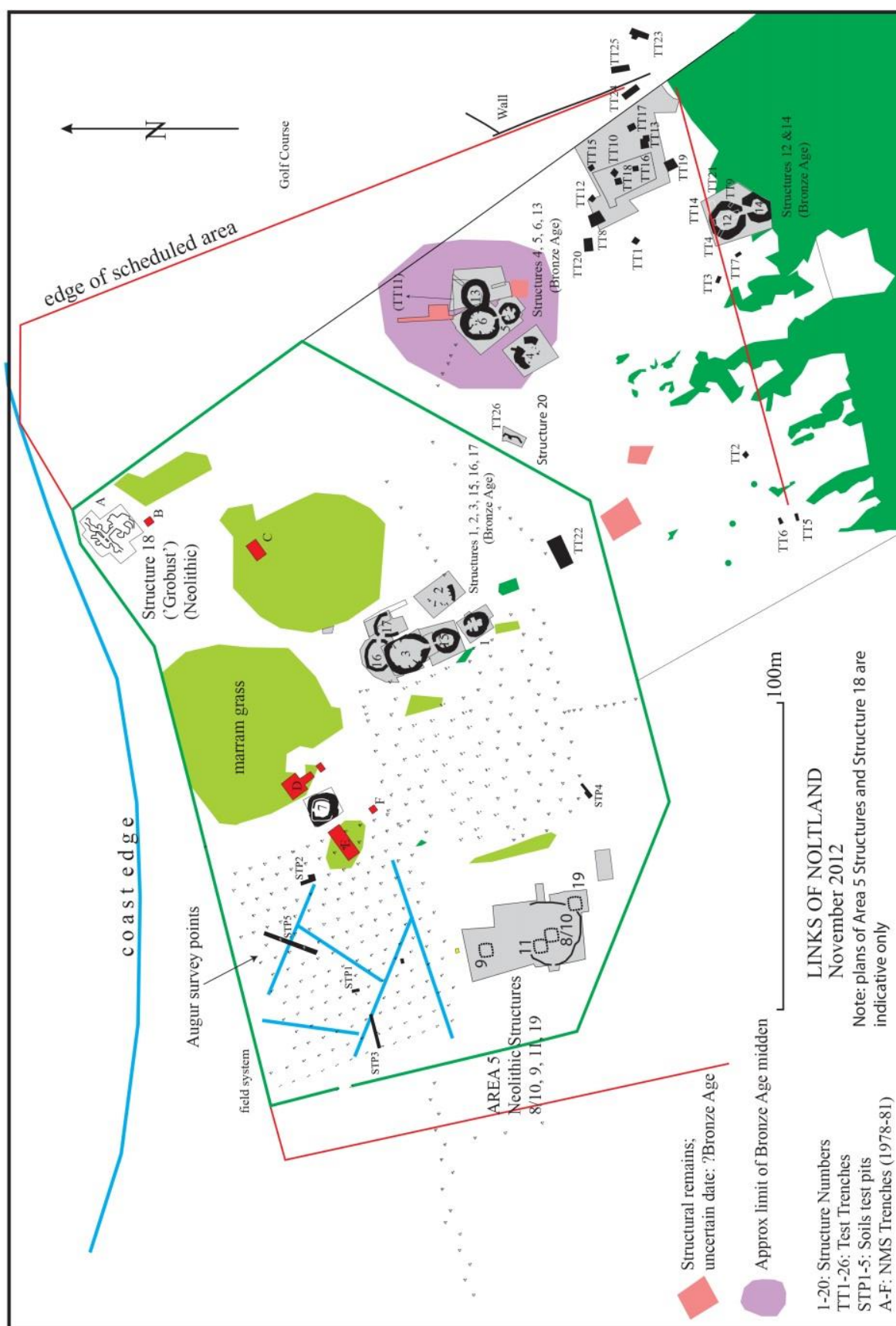
Gosden (2004, 43-44) identifies three key themes to be considered when evaluating visual work: art, aesthetics and display. ‘Art’ relates to the exercise of human skill and ingenuity to create visuals which have an impact on others, ‘aesthetics’ relates not only to a sense of appreciation, but to skills of

perceiving and evaluating both on a societal and personal scale, and 'display' singles out and presents objects, activities and ideas. The combinations of these elements are important in the management of disseminating knowledge and the communication of sensory experience. They can be evaluated from two key perspectives: that of the practitioner and of the audience. Although each perspective interacts with archaeological visualisation in different ways, both feed into one another and can inform aspects of the other's practice and consumption.

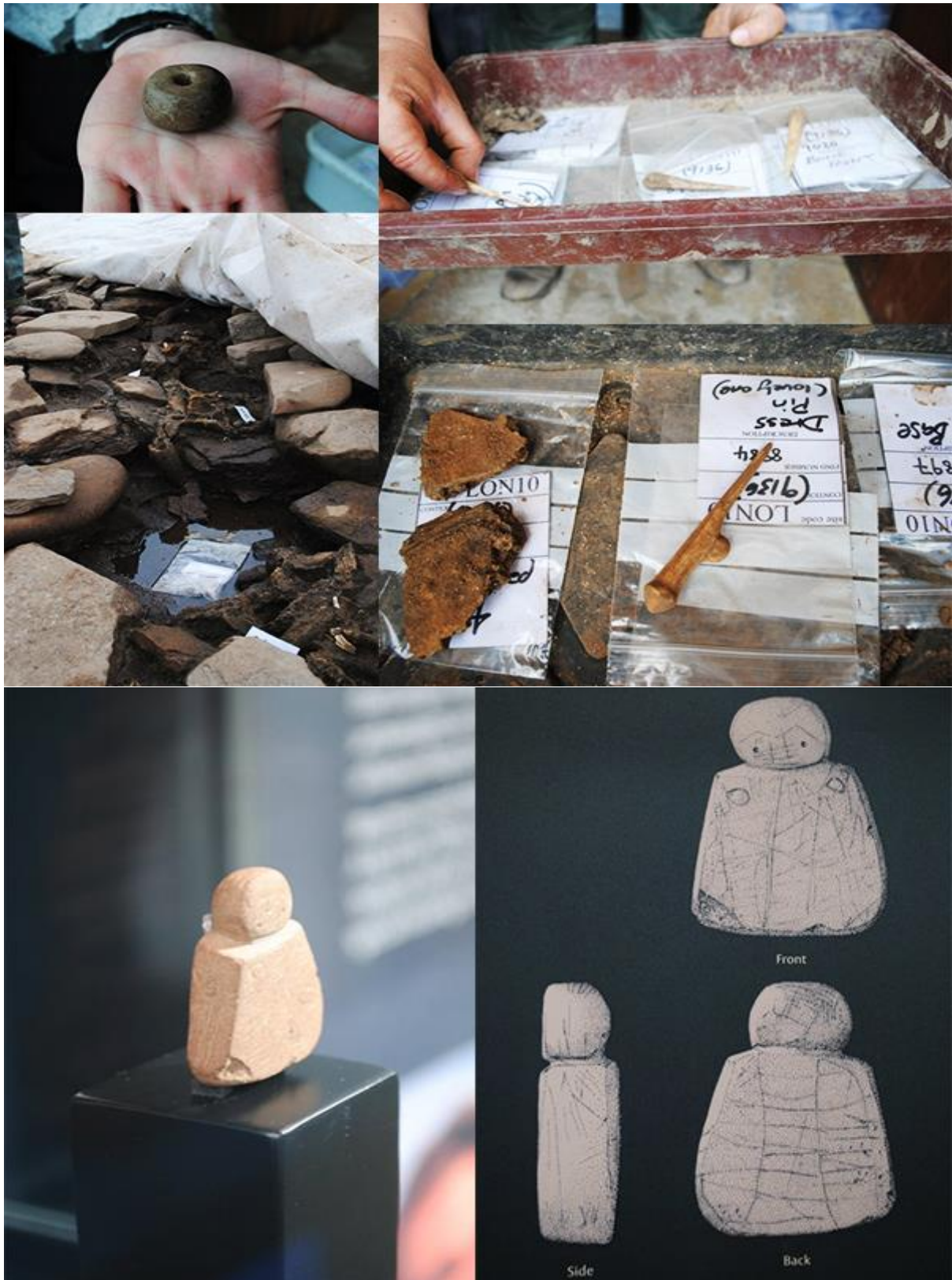
### **6.2.1 Refining a Methodology for Interpretive Visualisation**

The Skara Brae case study was experimental in nature in order to freely explore possibilities for enhancing practitioner engagement in the field and to push the boundaries of traditional visualisation practice. Despite the spontaneity of the methodology during this case study, the process could be evaluated as an archaeological research practice because fieldwork notebooks containing reflexive documentation on the collaborative nature of the work (which consisted of creative decisions, process and sources) were recorded throughout the fieldwork and creation stages. This project began to test the possibilities for archaeological visualisation from multiple perspectives and approaches and initiated the development of a methodology which made space for creativity and engaging experiences with the site and contemporary landscape. There are aspects of this methodology which can be further enhanced to make concepts within the visualisation process relatively consistent without being creatively restrictive.

Following completion of the *Digital Dwelling at Skara Brae* project an opportunity arose to produce an interpretive visualisation for another Orcadian prehistoric settlement site (Neolithic to Bronze Age) at the Links of Noltland on Westray, commissioned by Historic Scotland. This project once again involved collaboration between the team of visualisation specialists assembled for the Skara Brae work, which included the author, Kieran Baxter, Dr Aaron Watson and Dr John Was, who was involved from the outset of this fieldwork to develop the soundtrack alongside the visual material in the field rather than in post-visualisation as had previously been the case. This site has been subject to an extensive program of excavation (see Figure 6.1 and Figure 6.2) and consolidation since 2007 (though the Neolithic Grobust House had been identified and partially excavated in the 1980s) and in 2010 areas of the excavated site were laser scanned by members of the Historic Scotland Scottish Ten team. Today the site is rapidly deteriorating due to wind and sea erosion of the surrounding sand dune system, so much so that the prehistoric ground level is exposed in many areas of the site. Unlike Skara Brae or the village street on St Kilda, very little of the upstanding walls remain at Links of Noltland. This makes it difficult for a visitor to 'read' the site as the archaeology is very complex and potentially confusing to the expert and non-expert alike.



**Figure 6.1:** A site plan of the Links of Noltland detailing areas of excavation up to and including the 2012 season (Reproduced with permission from Historic Scotland).



**Figure 6.2:** The excavations at the Links of Noltland have revealed a selection of remarkable artefacts and practices including a series of cattle skulls placed within the foundations to a large structure within Area 5 and the 'Westray Wife' figurine (See Moore and Wilson 2011) (photos by author).

At the Links of Noltland the first stage of fieldwork continued on from where the Skara Brae work had left off, with the team adhering to the established methodological practices of allowing time for contemporary site visits in the wider landscape, walking the site with highlighted copies of site reports and relevant literature and establishing initial engagement with the site through the familiarity of each practitioner's technical practice before embarking on the production of an appropriate interpretive narrative for the visual output.

The intention was to generate visual and audio content which would both complement and juxtapose any proposed online content and the current exhibition collection in the Westray Heritage Centre, providing an additional dynamic interpretive perspective to the site. Fieldwork was conducted by the collaborative team over two separate trips, the first in May 2013 and the second during the excavation season in August 2013 (see Figure 6.3 and Figure 6.4). The methods used on these fieldwork trips further developed the methodology initiated at Skara Brae in two key ways:

- The *Digital Dwelling* film was experimental and largely driven by investigation of practitioner engagement during the data capture stage. The team made gut-decisions on site, largely focussing on the process of engagement over and above the outcome. As such, the resulting film cannot realistically stand alone in an interpretive context without explanation by means of a talk or the accompanying exhibition. Consequently, work at the Links of Noltland gave greater consideration to the needs of the final audience.
- Collaboration between the select practitioners involved in this project naturally resulted in an audio-visual output unique to the team because of their own personal creativity, individual specialisms, techniques, and the overall team dynamic. However, key concepts from this methodology present a number of themes which are applicable to visualisation practice as a whole; this fieldwork aimed to further define these themes.

Building upon concepts initially explored at Skara Brae of 'dwelling' within the site and wider landscape, at the Links of Noltland each practitioner began to engage with the site by means of their own specialist techniques (kite aerial photography, filming, sketching, and sound recording for example) in order to structure their own 'ways of seeing' through familiar practice. Affording time on these focussed activities and settling into the site was found to be important in allowing the more subtle nuances of the environment and the site to be revealed. At Skara Brae the team were afforded the experience of 'dwelling' within an upstanding site, within the prehistoric passageways and houses.





**Figure 6.3:** Fieldwork at the Links of Noltland, from top: engaging through a familiar practice by sketching onsite (author), the author and Was conducting interviews with the excavators in the site hut during the August fieldwork (photo by Graeme Wilson), one of Baxter's kite aerial photographs of the excavations around structure 7, walking the site and familiarising with the excavation reports and exploring the wider landscape of Westray (author).





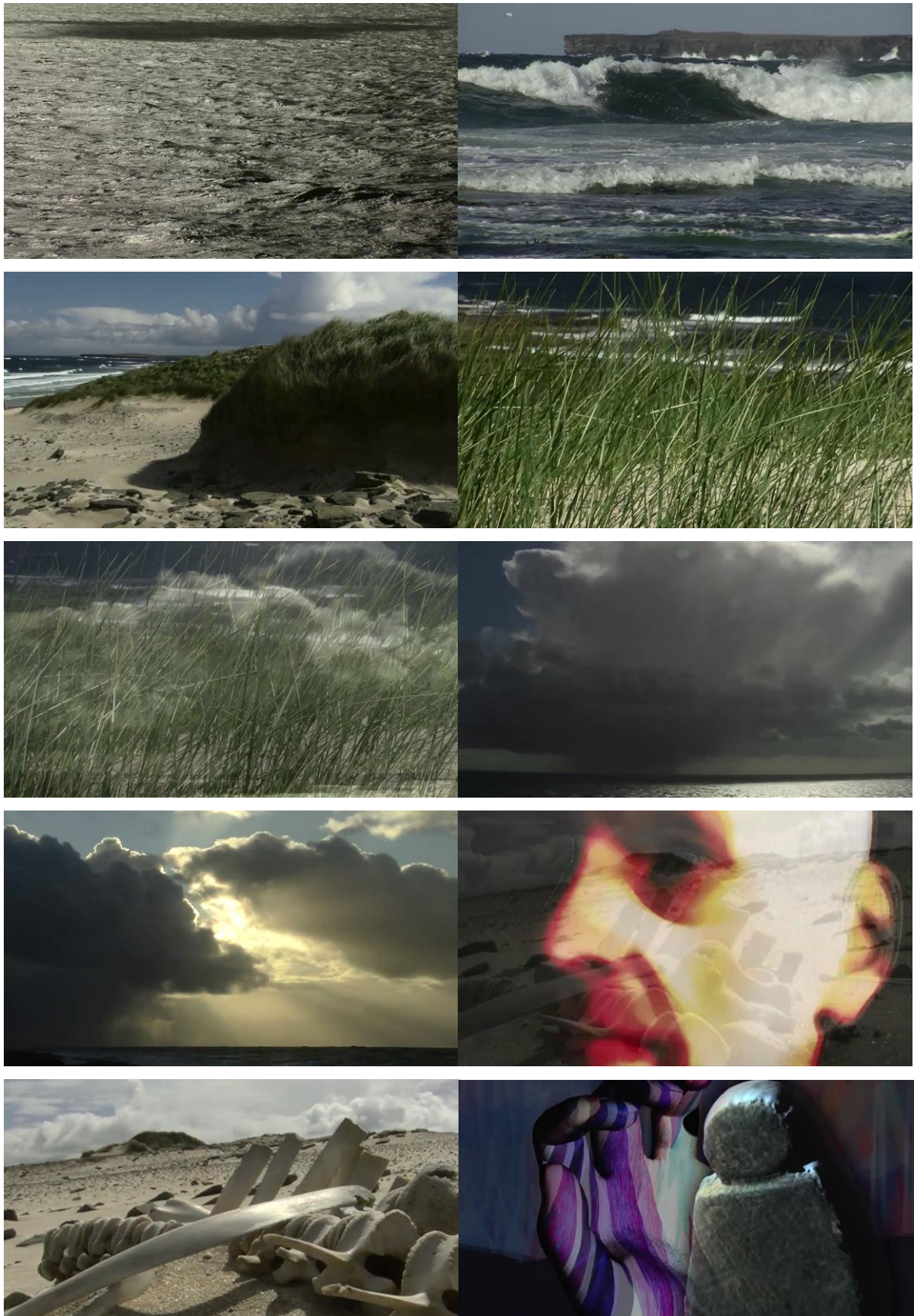
**Figure 6.4:** More fieldwork at the Links of Noltland, from top: conducting photogrammetry of various artefacts onsite and in the wider area, some of the sketches and notes from the author's notebook, recording ambient environmental sounds at Grobust Bay and walking the site with excavation director Hazel Moore (photos by author).

At the Links of Noltland this perspective was not possible, though it should be recognised that 'dwelling' has an invested interest not only with the structures themselves, but with the wider context of the site's relationship to the surrounding landscape. In conjunction with the Skara Brae methodology, inspiration for stories to tell as part of the interpretive narrative naturally find their origins in the way the site is experienced in the present day.

Discovery and the on-going excavations were considered to be crucial to the story of the site and as such the team believed the excavators should have a presence and a voice in the content produced, folding the present and past timescales together to visualise the current fieldwork alongside interpretation of the archaeological record. Furthermore, engaging with the excavators during their excavations at the Links of Noltland meant the team could discuss interpretation of the site first hand, before their experience and interpretive ideas were distilled into documentary reports. Telling the story of the site through sound clips of the excavators discussing the material as opposed to the authoritative voice of a single narrator is intended to bridge the problematic gap between speculative interpretation and the communication of a subjective process, allowing ambiguity and intangibility to be expressed simultaneously.

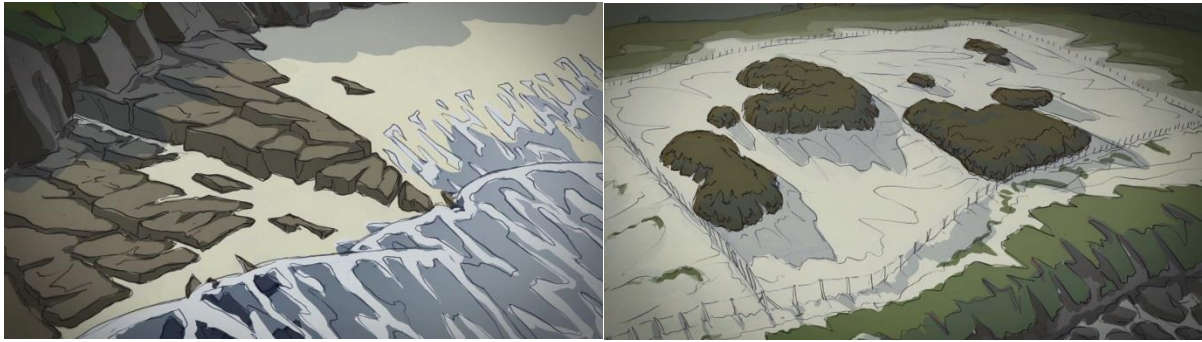
In order to begin to assemble some of the initial material and ideas following this fieldwork the team produced an animatic. This is an animated storyboard which essentially acts as a graphic organiser to pre-visualise the content, sequence and timing of an intended final outcome such as an animation or film. The production of an animatic provides a simplified impression of how scenes will look and feel with motion and timing and is particularly effective when working with visual effects and animation (which are both time consuming and often costly processes). This allows narrative, camera positioning and timing issues to be addressed and adjusted prior to any major work being completed which is particularly useful when working on the visualisation of archaeological sites whose interpretation can change frequently throughout the course of an excavation. The animatic for the Links of Noltland was produced by scanning in a series of hand-drawn storyboards which were then digitised and coloured in Adobe Photoshop and partially animated using Adobe After Effects to simulate camera movements and cuts. Alongside the animatic the team assembled some of the digital video footage set to an example soundtrack comprised of ambient and instrumental sounds. Using the animatic and this example environmental footage and sound (all included within the folio for this thesis and additionally pictured in Figure 6.5 and Figure 6.6a-e) the team were able to convey and further develop the initial ideas and possibilities for the visualisation of the site. In this sense both the animatic and the audio interviews in particular can be seen as a further development of additional paradata for the project as it continues to evolve.



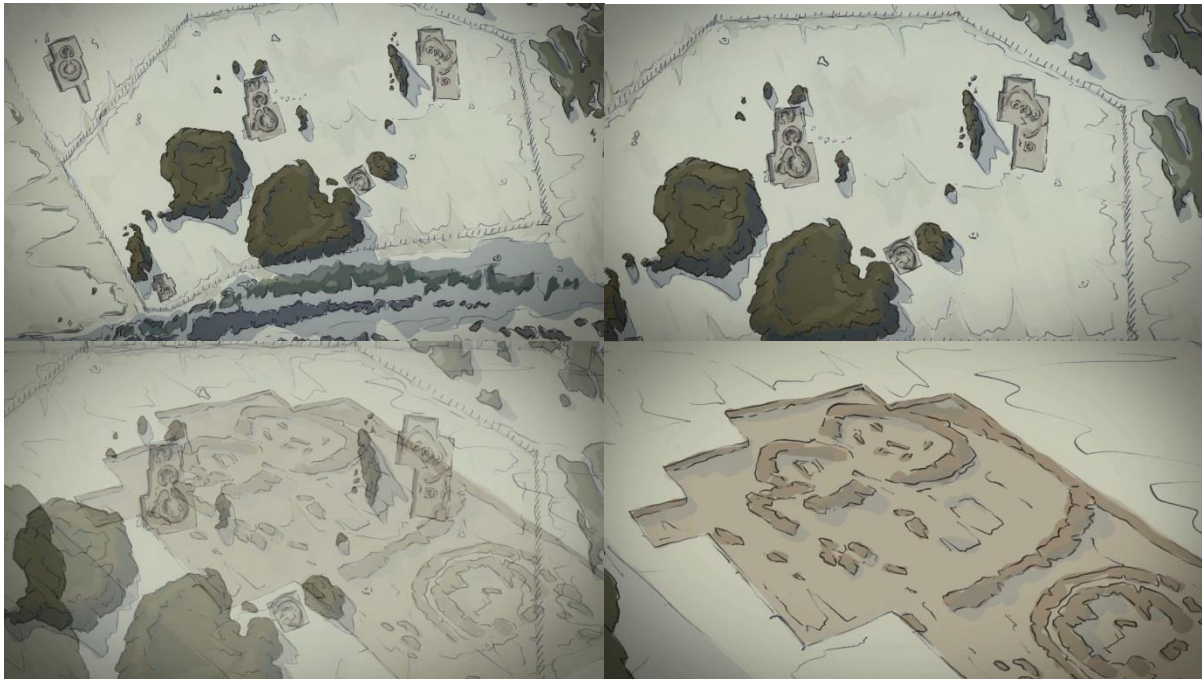


**Figure 6.5:** A sequential collage of Watson's vignettes of the site together with some initial character and artefact visualisation.





*Opening shots approaching the site from the East side of Grobust Beach.*



*As the camera pans over the present day site the areas excavated from 2007-2013 fade into view, the camera then pans in towards area 5.*



*As the camera zooms in closer a reconstruction of the building where the 'Westray Wife' figurine was discovered fades into view.*

**Figure 6.6a:** A screenshot storyboard of the Links of Noltland animatic which initially developed a narrative based upon a rough chronology of the site together with a selection of key stories based on the finds and current theories about the nature of the site.





*The audience see a woman carving the figurine (this would be done using live-action filming) which is then isolated and the artefact becomes the focus. This artefact would be represented as a photogrammetry model.*



*The camera leaves the first building and pans over structure 9 nearby, whose foundations are being ceremoniously laid. This sequence is based on the reconstruction drawing by Alan Braby (Moore and Wilson 2011, 2).*



*As the camera pans over the foundations the audience focus on cattle skulls being placed within the walls. Once again a photogrammetry model of an artefact becomes the focus. As the camera leaves the structure the finalised roof appears, constructed from cattle hides.*

**Figure 6.6b:** A screenshot storyboard of the Links of Noltland animatic continued.



*The camera continues its journey towards the 'Grobust House' which materialises as a reconstruction as the camera zooms into the whalebone arch entrance.*



*The camera comes to rest inside one of the low passageways and focusses on a character placing a figurine into a small opening in the wall, together with some other objects.*

**Figure 6.6c:** A screenshot storyboard of the Links of Noltland animatic continued.





*The Neolithic structures at the Links of Noltland have been subject to 'closing rituals' whereby significant objects such as domestic animal skulls and human figurines were deliberately placed in backfill deposits when the structures were abandoned. This section of the animatic represents this practice and also acts as a closure point to the Neolithic phase of the settlement within the narrative.*



*The camera moves away from the Grobust building and on towards the Bronze Age structures nearby.*



*The camera zooms in to two large conjoined Bronze Age structures and enters the low passageway.*

**Figure 6.6d:** A screenshot storyboard of the Links of Noltland animatic continued.



*It then pans across the interior. In the animatic this scene has no activity as at the time of production the use of this structure was uncertain.*



*The camera leaves the structure, which fades back to the excavated remains.*



*The camera takes one final view back over the site and comes to rest on the field-systems with modern cattle bones jutting out of the sand, a reminder of the environmental difficulties which likely forced the community to eventually abandon the site.*

**Figure 6.6e:** A screenshot storyboard of the Links of Noltland animatic continued.

The team's overall understanding and impression of the site developed over the course of these two phases of fieldwork. Initially, following the first phase in May 2013 the team produced a selection of deliverables including an animatic, still kite photographs and digital video footage. Following the second stage of fieldwork during the excavation season in August 2013 the team had compiled a range of mixed-media materials representative of the site of which the majority could additionally stand alone as deliverables to assist the excavators with the current excavation and interpretation. To date, the material now consists of:

- Still kite aerial photographs contextualising the immediate surrounding landscape
- A photogrammetric mesh of the site compiled from kite aerial photographs
- Pole photography and photogrammetric meshes of the trench areas open during excavations in late August 2013
- High definition digital video footage which consists of small vignettes of the immediate and wider landscape and environment (sand, sea, cliffs, beach, grass and sky, under varied weather conditions as well as footage of modern cattle) and the excavators at work
- Photogrammetry of a selection of important artefacts including a carved stone ball, a number of figurines, grooved ware pottery, tools and carved stone
- Preliminary sketches of possible reconstructed structures
- Recorded interviews with excavators detailing their experience and the interpretation of the current evidence
- Sound recordings which encapsulate the immediate environment of the site
- Additionally the team have access to the Scottish Ten laser survey and aerial photos from previous years.

These initial assemblages of material and ideas gave structure and direction to the possibilities for visualising the site. As a consequence of discussions based around this body of work and the animatic in particular, the nature of the visualisation brief from Historic Scotland has evolved since its original conception. Thus, this growing collection of visual and audio materials has emphasised the value of a flexible approach which can be adjusted and modified without having to start over if and when changes are made to the initial brief.

In addition to the development of a collaborative fieldwork methodology, the initial concept of 'paradata' (as defined by the London Charter (Denard 2009)) has been adapted and reinterpreted over the course of this research. To begin with the creative process was documented through site notebooks which contained the technicalities of the methods used and creative decisions made. As the projects developed these notebooks also observed and recorded engagements with the act of collaboration:



conversations, critical reflections and ideas. The material accompanying the *Digital Dwelling* film (which differed across the contexts the film was shown in: taking the form of a book, a webpage or exhibition display boards) attempted to present this paradata in a format audiences could readily engage with alongside the output.

The work at Skara Brae opened up new dialogues with the processes of visualisation and collaboration which further evolved during fieldwork at the Links of Noltland. For example, the animatic represents a visual engagement with some of the ideas discussed during the early phases of fieldwork and in this sense provides a visual presentation of paradata. Additionally, in recording conversations with the excavators the team were able to capture the essence of the interpretive process in the discussions, speculations and disagreements captured. These experimental collections of audio and visual outputs present a form of 'active paradata' which can naturally form part of the final outcome, rather than remaining as a passive written record.

Fundamentally, this work has shown that adopting a post-processual methodology in the field encouraged the team to instinctively create self-reflexive paradata in conventional and unconventional ways using visual, audio and written methods. In light of this the collection and presentation of paradata will continue to be developed through future projects not only in the form of documented note-taking, but as an active part of the visualisation output itself. At present its perceived value has been restricted by the wider archaeological community by envisioning it in a purely textual documentary form. However, this research has demonstrated that it has the potential to communicate the more intangible side of the interpretive process to audiences when utilised across the stages of collection, creation *and* consumption.

### **6.2.2 Compiling a Visualisation Toolkit for Archaeology**

Given that the excavation work and interpretation for this project is on-going, an approach designed to produce one single outcome seemed inefficient and short-sighted. During the focus group for the Skara Brae project it was observed that one of the major issues with visualisation forming part of the interpretive process and informing active research is the feeling amongst archaeologists that producing a visualisation or a reconstruction somehow fixes the interpretation of the site at the time it is produced. This is problematic because it perpetuates the judgment made by the majority of archaeologists that visualisation is something which occurs at the conclusion of a project (James 1997, 27) when all the evidence has been collected, quantified and analysed (Gillings 2005, 226). In some ways this is logical as it goes some way to preventing wasted efforts. However, this judgement is grounded in the belief that the visualisation process is inflexible and the results final, which may be true of more traditional linear workflows, but in this context it can be addressed with a few fundamental alterations to the workflow

and the methodology. In order to explore this concept further, rather than work along a methodology which produced a singular final outcome, the team instead adopted an approach which operated on the basis of compiling a 'visualisation toolkit' for archaeology. This 'toolkit' approach constitutes a palette of material across a mixture of media and methodological approaches that can be edited together in a variety of ways dependent on current interpretation and intended context for output and dissemination. As a whole, the toolkit represents the archaeology of the site across a spectrum of different scales, from a wider landscape and structural context right down to artefacts and speculative intangible practices.

This is a process grounded in meticulous research which incorporates both scientific data and artfully crafted storytelling. Imagery based on scientific data alone reduces representation of the archaeological record into lifeless documentation, masking any sense of agency, intangibility, imagination, ambiguity or expression. Archaeological interpretive visualisation is the process of picturing the past in the present, for this reason it will never cease to be an activity which at its core relies on a personal engagement between practitioner, practice and the archaeological record. In discussing the cognitive process of artistic practice Smith (2004, 21) insists that mistakes and messiness are crucial to understanding and generating new knowledge. It is this intimate relationship between practitioner and visual process that makes space for meaningful engagement with the site or subject and develops visual interpretation in a way which captures the imagination of audiences.

Typically the social sciences have difficulty dealing with 'mess' (Law 2004, 2) and in attempting to describe and simplify the often messy processes of creativity and interpretation complex practices are often reduced to meaningless method akin to Tufte's (1990) 'flatlands' (as defined in Chapter 2). Quantification and transparency ask for order, conformity, systematic process and repeatability, but these attributes are not often feasible or desirable within visual research practice. If interpretive visualisation cannot be quantified in a traditional sense, practitioners within this field need to take greater responsibility for their images by establishing a deeper reflexive understanding of their process. This responsibility need not rely on the problematic crutch of scientific quantification and transparency, which aims to conceal the artistic craft and interpretive ingenuity of the practitioner. Rather than simply prescribing repeatable methods and processes to be documented and stored (though reflexivity and documentation are a fundamentally important part of visual research many of the processes within visualisation practice are fleeting, ephemeral, and as such, impossible to articulate and document) the field must learn to afford more intellectual weight to practitioner skill and competency. In order to assure this competency the field needs to invest more time in establishing visual literacy amongst its practitioners and the wider academic community.

In light of this the visualisation toolkit aims to provide archaeological visualisation specialists with a means of working which affords more creative flexibility within the visualisation workflow while ensuring that a high level of visual competency and awareness is upheld. Although the case studies within this thesis demonstrated that creative practice does not conform to a singular linear pipeline, certain practices and concepts can be adopted by others in the wider field. Workflows will change and evolve with each unique site and the individuals involved (in terms of their background, specialism and creative style), though a number of fundamental methodological practices can be established:

- Process-led practice which explores ways of working which embrace thinking through doing
- Facilitation of time spent 'dwelling' within the site and wider contemporary and natural landscape
- Engagement through the familiarity of practice
- The layering of subjective and objective methods to develop a range of perspectives for the site.

The Skara Brae work went some way towards demonstrating that different media could influence the way an audience would perceive the information being communicated and the extent to which that information should be taken as truth. For example, as the narrative became more subjective the media changed to hand painted elements and long-exposure footage, conveying abstraction, mystery and disorientation. It is feasible to further develop these ideas into a coherent 'visual language' which makes use of different visual styles and audio cues in order to establish a consistent means of communicating subjectivity to general audiences. This visual language can be seen as a way of making use of the power of images and in a sense harnessing and flipping the issues of seduction and the problematic perception of photorealism raised by the likes of Smiles and Moser (2005) and Frankland (2012) to the advantage of the practitioner.

### **6.3 Rethinking Boundaries**

Within the academic and public audiences who viewed the Skara Brae film and exhibition there were some consistent results which suggest that a large proportion of people, regardless of background, harbour particular expectations and presumptions about the role of visualisation within archaeology. More often than not this pertains to an expectation that visualisation can and should present a singular truth about the past. The general impression following review of the Skara Brae feedback was that on some level the general public in particular have been led to believe that the pursuit of archaeology (excavation, survey and so forth) reveals answers about life in the past, when in reality it simply brings evidence to light. Just as the interpretation of evidence cannot be presented as a definitive truth,

visualisation cannot be taken to represent a single answer. Realistically the notion that an interpretive image can be singularly 'right' or 'wrong' is almost impossible.

In order to understand why these problematic presumptions and expectations exist it is necessary to consider the way in which these sites are currently presented and experienced. Most of the landmark archaeological sites in the UK project a very recognisable aesthetic which has the effect of whitewashing sites from different periods with different functions and varied significance into one homogenous and somewhat choreographed experience. Nearly two decades ago Brett argued that the visibility of heritage has itself become a form of popular history.

"Buildings, parks, exhibitions and displays are created by organisations that have their particular values and assumptions inscribed in their products. These products are prescriptive and normative because they have been given concrete form; their guiding intentions (conscious or otherwise) can often be quite precisely assessed. A direct study of the physical manifestations of heritage – quite literally, its construction – reveals something of the values and ideological functions of the concept."

(Brett 1996, 12)

Historic Scotland adheres to guidelines for the production of their interpretive visualisations. In their strategy document they define their use of the term 'interpretation' as,

"the public explanation or discussion of a cultural heritage site, encompassing its full significance, multiple meanings and values, which aims to forge emotional and intellectual connections between the interests of the audience and the meanings inherent in the subject matter."

(Historic Scotland Interpretation Unit 2012, 8)

Essentially Historic Scotland advocates interpretation as a communicative tool which takes complex information and translates it into entertaining, knowledgeable content. In defining interpretive visualisation strictly as being for the dissemination of information, "the knowledge bridge from the experts...to the non-specialist public/visitor" (Historic Scotland Interpretation Unit 2012, 6) they restrict themselves to illustrating only the most tangible representations of a heritage site. As a direct result of this particular notion of 'archaeological' or 'interpretive' visualisation an expectation on the part of the visitor has developed whereby they visit a site *expecting* a certain type of visualisation to be consumed in a certain way. These expectations are problematic as they encourage a mind-set which consumes these

images in a way which ‘fixes’ this single visualisation of the site in the minds eye, an issue which has previously been addressed by Swogger (2000) as what he terms “the tyranny of representation”.

At present in archaeology both practitioners and audiences produce and consume visualisation within boundaries of expectation, technology and perception. Consequently, these boundaries result in tensions developing between areas of archaeological practice. For example, the perception of digital visualisation and survey as scientific and quantifiable has resulted in its practice being placed within a restrictive boundary which views any integration with subjective media or methodologies in a negative light. Similarly, expectations placed upon techniques of reconstruction and visualisation in the academic and public eye has caused an inflexible and problematic attitude towards the consumption of these images. Archaeologists and practitioners of visualisation must ask themselves why this is still the case. Despite the consistent use of phrases such as ‘the artist’s impression’ and insistent captions declaring that these images only depict ‘what the site *might* have looked like in the past’, audiences continue to make assumptions about the authority of an image based on media and context. In order to remedy the situation interpretive visual material must be presented to audiences in a way which reflects the broader processes of archaeological interpretation. Thus, archaeologists cannot simply state that an image is a speculative interpretation, they must also demonstrate to an audience *why* this is the case.

This research has gone some way to manipulating and redefining these evident ‘boundaries of expectation’ by implementing a methodology which mediates interpretation with different techniques. Taking the *Digital Dwelling* film to a variety of audiences not only demonstrated that images *are* indeed persuasive (as argued by the likes of Berger and Mohr 1982, Smiles and Moser 2005 and Shanks 2012) but that there *are* tangible ways in which audiences can begin to engage in a more meaningful way with interpretation. By showing the film on site visitors were able to engage with it alongside the more traditional forms of media and representation presented in the visitor centre and on boards around the site. Encouraging visitors to engage with a selection of visual material which represents different interpretive approaches to the site presents a positive step forward in re-thinking the ways in which audiences have previously become accustomed to consuming this type of material. Just as the practices of both archaeology and visualisation involve a series of interpretive decisions, audiences must also be enabled to make informed choices in their consumption of visual material at heritage sites. However, more work needs to be done in this area to mark a significant change in approaches to visualisation and attitudes towards consumption. Archaeological visualisation is a complex area of research which exists at the convergence of evidence, interpretation, scientific data collection and storytelling. Further questions need to be raised and addressed in order to understand these evident boundaries. For example, to what extent should an audience be encouraged to engage with visual material on a personal and emotive level



and how much freedom should they be given to form their own experience and understanding of the site?

The *Digital Dwelling* film operated along a single central narrative journey through Skara Brae, taking a cinematic approach to storytelling where the audience moves with the protagonist along a pre-defined pathway. Arguably, within this 'fixed' method of presentation there is no scope for exploration or independent discovery. This is an interesting area which is being explored at present with the use of gaming platforms for heritage outreach (see for example the *Open Virtual Worlds* project led by the University of St Andrews (Kennedy *et al* 2013)). Without remaking the film in a gaming environment it is difficult to speculate on whether the 'experiences' presented as part of a sequential narrative would affect the audience's engagement with the material. Certainly, the narrative progression from the present day ruins to the reconstructed Hut 7 would be disrupted, as would the gradual development from objective representation to subjective interpretive storytelling. Even within interactive gaming platforms content is ultimately pre-determined and regardless of the order in which elements of the interpretation are encountered and revealed the same stories unfold.

The nature of creative practice and interpretive storytelling is such that there will always be multiple possibilities to convey the same information. Each decision in the field or at the storyboard constitutes the definition of a new set of boundaries specific to the task in hand. The field as a whole needs to establish a new way of thinking and consuming interpretive archaeological images, which will require the un-learning of many common preconceptions and expectations of archaeological reconstruction or visualisation. The multitude of papers concerning mechanical specifics, technological best practice and documentation (metadata and paradata) is testament to the fact that practitioners of interpretive archaeological visualisation are under constant pressure to quantify their work. There needs to be an acknowledgement and above all an *acceptance* amongst archaeological and heritage professionals that creative practice cannot be justified solely through scientific and systematic means. On some level this will require practitioners to present clearer evidence to support the ways in which their own processes of image-making and visualisation relate to the broader debates about archaeological interpretation. Once there is a wider understanding and acceptance of the creative processes involved in this complex interpretive field practitioners will feel confident in taking personal responsibility for their visualisations. This in turn will influence the way interpretive visualisations are presented in heritage contexts, and the extent to which audiences are challenged and invited to engage more readily with the material.

### **6.3.1 Where Next?**

The *Digital Dwelling at Skara Brae* film proved to be successful on a scale which the team had not initially expected. In addition to the film being shown at the Pier Arts Centre in Stromness as part of a two month

run of Jim Pattison's *Models of Mind* exhibition, it was also invited for submission to the Alchemy Film Festival. Furthermore, the British Museum in London worked with the author to produce a series of four two and a half hour long children's workshops which explored art and expression in Neolithic Orkney and successfully ran on the 22<sup>nd</sup> and 23<sup>rd</sup> March 2014.

The Links of Noltland project is ongoing and the collaborative team will return to the site during the planned 2014 season of excavations to collect further material which supplements the evolving visualisation toolkit. This growing toolkit serves to introduce and explore the site from a macro to micro scale while establishing a meaningful sense of place and human occupation over time.

## **6.4 Conclusion**

The *Digital Dwelling* film attempted to create a more meaningful kind of critical engagement with the representation of the archaeological record by challenging what is meant by visualisation and interpretation, traversing the divide between subjective and objective practice. In reflexively examining the chaotic, messy and often unpredictable process of archaeological visualisation across a number of techniques and approaches it was possible to establish a greater understanding of its value and application to the field. This research has examined what visualisation using a range of contexts, techniques and media can do and what it is capable of when applied within a methodology which celebrates creativity. However, it has also demonstrated that academic and general audiences alike often harbour misplaced expectations towards archaeological visualisation. These are not problems which can be resolved easily, but this research has taken a vital step towards addressing these issues and examining practical means which move towards a solution.

Although there are a multitude of applications for expressive visual media within archaeological discourse at present, few in academia actively engage with expressive practice as part of their research methodologies. As Morgan (2012, 77) observes, studies about visual media produced by archaeologists acting as visual practitioners themselves are rare. This research has actively addressed these issues, using the case studies to examine current practice and to combine a range of visual approaches within a developing creative methodology, exploring themes in agency, materiality, lived experience, phenomenology and representation. These themes have been advocated by various authors (for example, Gosden 1994, Tilley 1994, 1996, Thomas 1996, Ingold 2000, Jones and MacGregor 2002, Hodder 2012) but are rarely demonstrated through examples of practical work. In Chapter 3 the conflict between post-processualism and digital technologies was addressed in terms of their perceived incompatibility (see Whitley 1998 and Zubrow 2006) on the grounds that subjective and objective approaches cannot coexist within a single approach (Zubrow 2006 and Jones *et al* 2011). This research

has challenged these preconceptions by utilising, analysing and layering a selection of mixed-media approaches and methodologies, demonstrating that rather than simply being able to coexist alongside each other, these differing methods can in fact serve to complement each other and strengthen the interpretive process and final outcome.

It is easy to critique archaeological visualisation as it is currently presented across both academic and public heritage contexts. If the field is to see a change in the way visualisation is produced and consumed there is a requirement for a more coherent body of theoretical literature to support practitioners in their work. The London Charter and other such best practice initiatives go some way towards providing a framework for this type of interpretive visual work, but to expect such a small body of literature to support such a vast field is problematic. Furthermore, Jordanova (2012, 66) has previously observed that even if it were possible for all elements of the visualisation process to be identified and captured, at present there are few incentives for makers to record their creative processes. There needs to be an increase in practitioners of visualisation publishing papers and research agendas which engage with their process in greater depth and avoid focussing solely on technology and aesthetics over methodological theory and interpretive substance. As Cochrane and Russell (2007, 4) observe, if the field of archaeology continues to downplay the importance of reflexive visual literacy and the complex dialogues which develop during the process of interpretive visualisation, then the meaning and value of visualisation for research practice within the field remains threatened.

Fundamentally, the process of interpretive archaeological visualisation will always remain a personal one. Reflecting on his own engagement with the Neolithic settlement site of Çatalhöyük in Turkey, Grant Cox emphasises the subjective and personal connection he has with his visualisation work:

“I mean this is my house. You know, it is their house, but it is my house too. I built this house.”

(Quoted in Perry 2014, *forthcoming*)

As a discipline the field of archaeology needs to learn to overcome its deeply embedded preconceptions about the implications of creative practice as an active and engaging part of the research process. Rather than being inexplicable and unwieldy, this research has demonstrated that, although often chaotic and ‘messy’, interpretive visualisation as a creative practice can prove to be a more reflexive, honest, analytical, comprehensive, transformative and engaging process than it is often perceived.

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